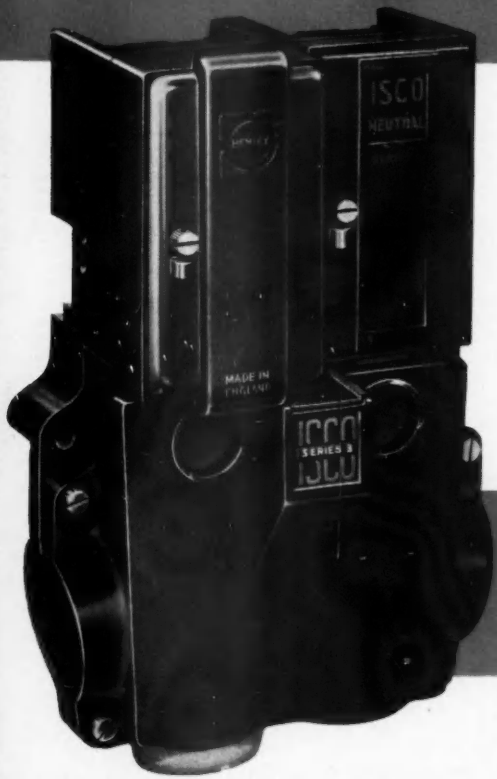
ELECTRICAL TIMES

THURSDAY
9 JULY
1953
NINEPENCE

INSULATED SERVICE FUSES



Double-pole Insulated Service Fuse arranged for one fuse and one neutral connector with combined 4-entry sealing chamber.

The following are interesting features:—

Double and Four-pole models with combined sealing chambers.

Single-pole with Neutral Connector Boxes and separate 2 and 4-pole Sealing Chambers.

Cartridge Fuse-links to B.S.88: 1947.

For cable conductors up to .04 sq. in. or up to .06 sq. in.

With single or double entry Terminals.

All current carrying parts tinned.

UP TO 60 A 250 V

In the range of HENLEY Insulated Service Fuses there is an arrangement to meet your requirements. Please ask for Catalogue 43.

● DELIVERY FROM STOCK

HENLEY
ELECTRICAL DISTRIBUTION EQUIPMENT

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.,
51-53 HATTON GARDEN, LONDON, E.C.1

Mechanical Applications of Paxolin
Paxolin laminates, used for a multitude of electrical applications, are also widely employed for mechanical purposes. The material is half the weight of aluminium but tough and easily machined and as it is supplied in a variety of grades the most exacting conditions can be met. Cams, drilling jigs, templates, and moulds can be fabricated from this versatile material as well as countless components for tools, clocks, instruments, and other devices. One special application is bearings. We have supplied not only small ones but some of massive proportions. We are also equipped for the production of very large moulded laminates such as door panels. Paxolin is well established in the mechanical as well as the electrical field.

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The Micanite & Insulators Co. Ltd.

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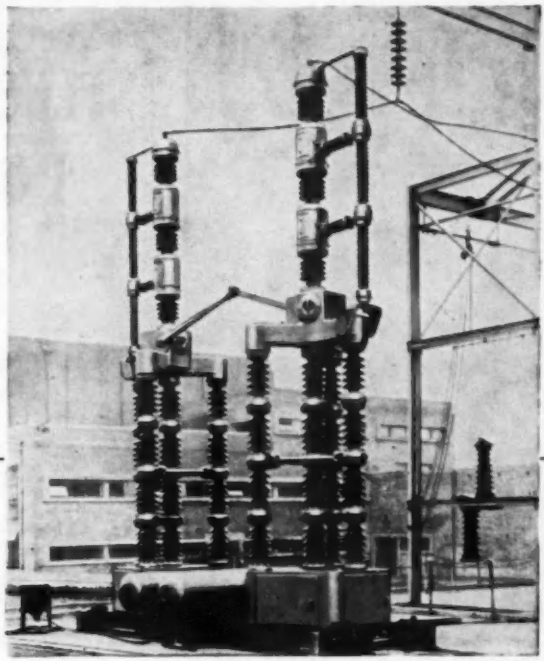
Manufacturers of MICANITE (Built-up Mica Insulation). Fabricated and Processed MICA. PAXOLIN Laminated Materials. PANILAX Laminated Materials and Mouldings. EMPIRE Varnished Insulating Cloths and Tapes. HIGH VOLTAGE BUSHINGS & TERMINALS. Distributors of Micoflex-Duratube Sleevings, Micoflex-Durosleeve (Plastics-covered flexible metal conduit) and Kenutuf Injection Mouldings (in most thermo-plastics including P.V.C.)

One of the range



Illustrated is the 275kV, 7500 MVA six-interrupter circuit breaker, one of the range of 'ENGLISH ELECTRIC' high voltage air-blast circuit breakers using common interrupters and other standard parts. This circuit breaker is one of those selected by the British Electricity Authority for use on the British Super Grid.

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air-blast switchgear

THE ENGLISH ELECTRIC COMPANY LIMITED, Queens House, Kingsway, London, W.C.2.

Switchgear Department, Stafford.

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

SH.7

See the English Electric advertisement for Domestic Appliances which appears on page 28 of this issue

A

. . . for divers bends

WE design and manufacture machines for the bending of all kinds of tubing up to 3" in diameter. With these there is, in addition, a unique bending unit to facilitate the bending of ½" to 2" steam and gas tubing through 180°.

These machines are particularly suited for use with steam and gas tubing—copper tubing—electricians' conduits—light gauge, solid drawn brass tubing—aluminium tubing and light gauge steel tubing. Full service facilities are available and special machines can be designed to order.

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THE STEEL COVERED HEATER UNIT

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IN its variety of forms, the Cressall steel jacketed unit heater is the solution to most heating problems. Let a Cressall Technical Expert discuss heating with you before you decide. He will be happy to help.

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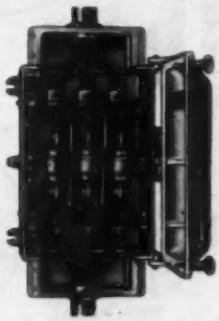

IMPERIAL FUSE SWITCHES.

35 M.V.A. SHORT CIRCUIT "MAKING" TESTS

PREVIOUSLY TESTED AT 25 M.V.A., NOW SUCCESSFULLY TESTED AT 35 M.V.A. 440 VOLTS.

SIZES OF 30, 60, 100, 160, 200, 300 AND 500 AMPERES WERE TESTED AND ALL SWITCHES WERE FIT FOR NORMAL USE AFTER TESTS.

ENGLISH "ELECTRIC" CARTRIDGE FUSE LINKS WERE USED IN THESE FUSE SWITCHES.

FOR DETAILS OF IMPERIAL FUSE SWITCHES SEE PUBLICATION IM 153.

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LONDON, S.E.1. A. W. ZELLEY, 6 PETER ST. | MIDLANDS. G. H. GABBETT. HEAD OFFICE. | NORTH MIDLANDS. C. G. BACHELOR. HEAD OFFICE. | CHELTENHAM C. GEARING, LECKHAMPTON HILL. | MANCHESTER 3. H. H. POLLARD. WOOD STREET. | BRISTOL 2. W. L. WHITE. CANNON LANE. | YORKSHIRE. H. WAPPLES. HEAD OFFICE. | GATESHEAD 8. L. J. BANKS. | GLASGOW J. BLAKEMAN.

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ICL ENTERPRISING ENGINEERING

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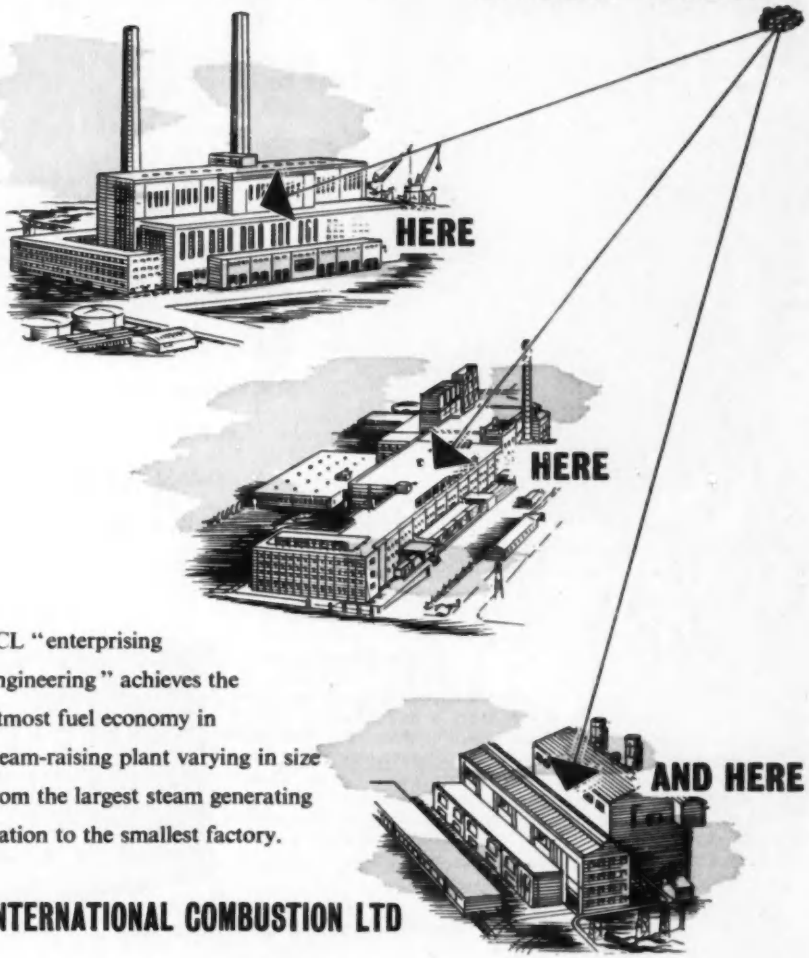

ICL "enterprising engineering" achieves the utmost fuel economy in steam-raising plant varying in size from the largest steam generating station to the smallest factory.

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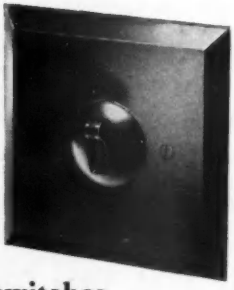
MK77

Let me tell 'ee

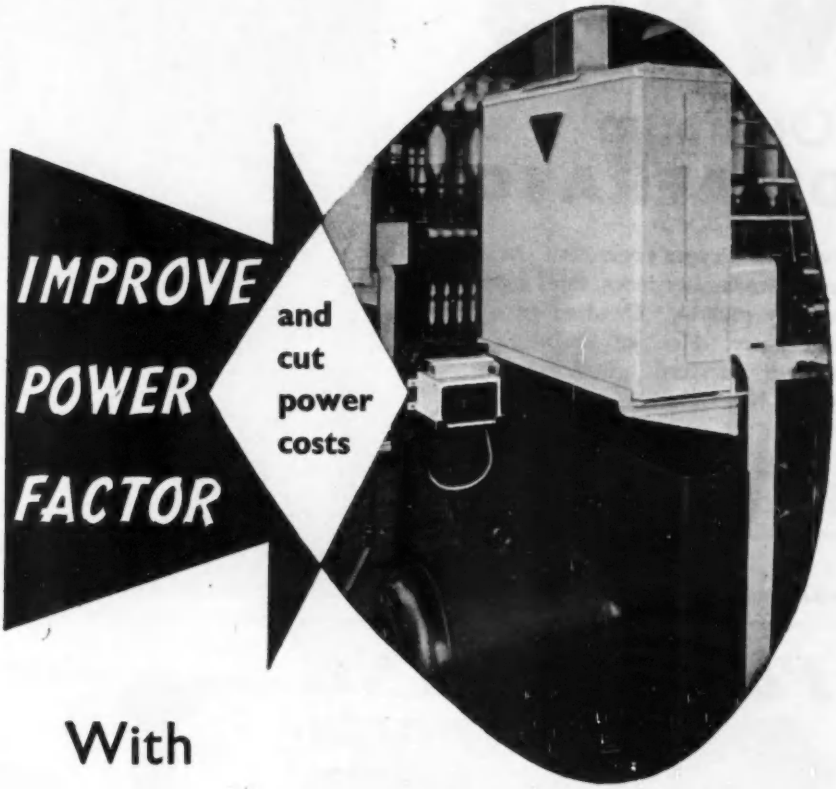
This 'ere danged electricity frightens Oi, creepin' about all silent like. Taint natural! Never know where it's coming out of next. Young Tweezle from electric shop says Don't you fret, Granfer. I'll fix MK switches and you'll be safe as if P.C. Badger were on guard. You won't get no volts a-coming out after you, nor no amps neither.

Young Tweezle doesn't exaggerate. Where safety is concerned, MK are pioneers. The AC switches he uses have pure silver contacts with positive separation and robust, track-resistant mouldings. The spring-cushion dolly has no 'slack' in either position. As for silent operation MK switches have P.C. Badger beat every time.



MK ... the mark of the best switches

MK ELECTRIC LTD London N18 Telephone: Edmonton 5151 DH8



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BICC Power Capacitors connected to motors will automatically improve the power factor and so reduce losses to a minimum. When tariffs include a power factor clause, BICC Capacitors make a direct and valuable saving on electricity bills—and usually pay for themselves within a short period. They are easy to install and occupy little space. Control is simple, losses are small and maintenance is negligible.

Write to-day for Publication No. 251 giving further details. Specialist BICC Engineers are always available to advise freely on any power-factor problems.

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'Optimum' DE-AERATOR

Prevents oxygen corrosion in boiler tubes, economiser tubes, turbine blading, etc., by removing dissolved gases from feed water. Heat of operating steam retained in feed water. Write for reprint No. GH.20.

G. & J. WEIR LTD
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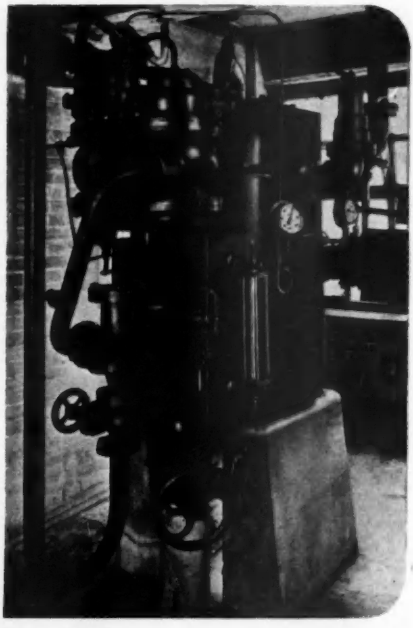
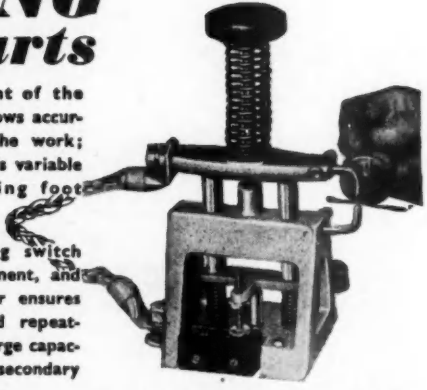


For WELDING small parts

Vertical movement of the upper electrode allows accurate alignment of the work; electrode pressure is variable without increasing foot pressure.

The pilot initiating switch has a micro-adjustment, and the electronic timer ensures accurate, high-speed repeat-performance. The large capacity transformer is secondary tapped.



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Smee's 568

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You can rely on an ELLISON product.

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MEET THE NEEDS OF INDUSTRY!

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All **Crypton** Rectifiers are built to the high standards of quality which ensure efficient, trouble-free service.

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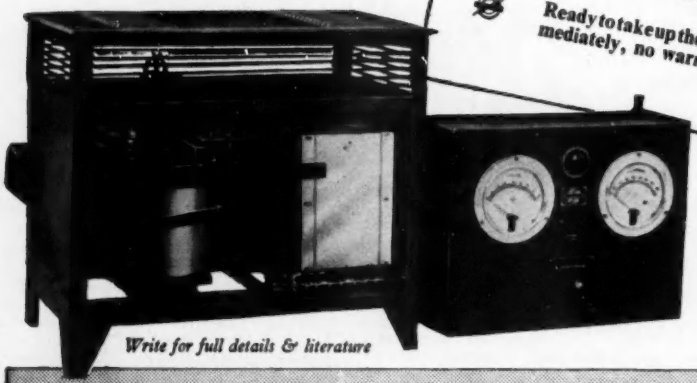

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I.R.23

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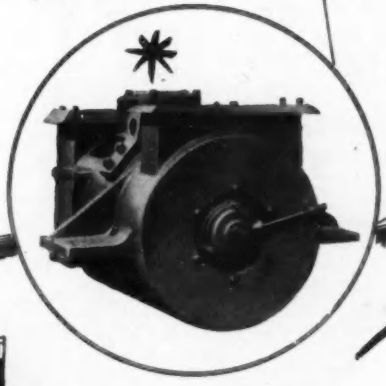

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Switchgear Works: BRIDGWATER, SOMERSET Phone: Bridgwater 2882

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-if not, write NOW

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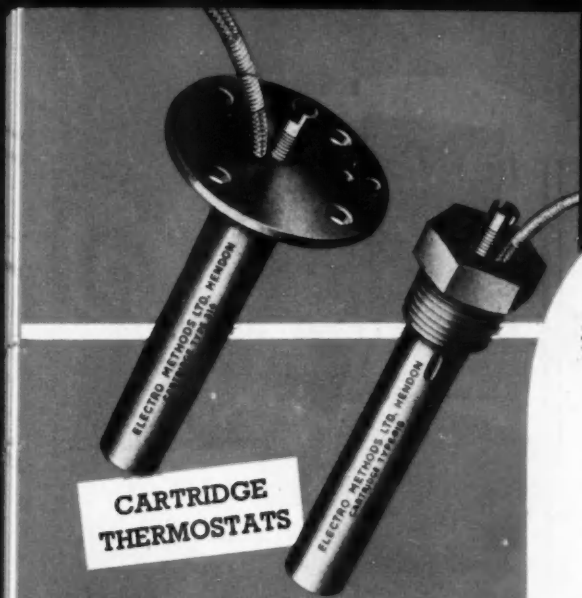
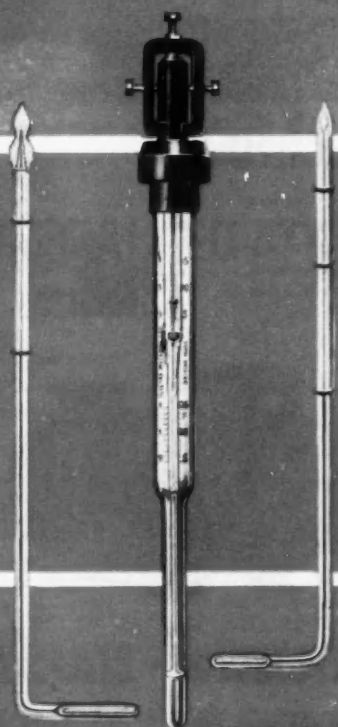
Requests for these and all other Nettle publications will receive prompt attention. Your enquiries are invited

NETTLE ACCESSORIES *Ltd.*
HARPER ROAD WYTHENSHAWE MANCHESTER



CARTRIDGE THERMOSTATS



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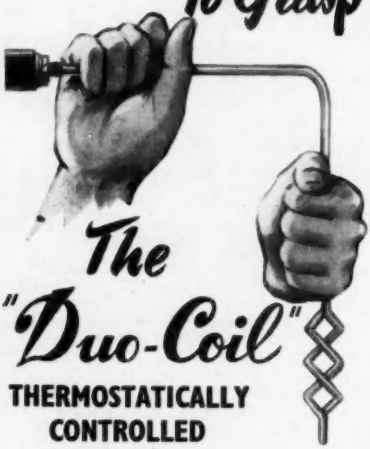

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LOWEST INSTALLED COST

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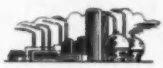
is a serious business

In many industrial processes, production depends upon constant



liquid flow — upon, in fact, reliable pumping.

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For over 100 years Worthington-Simpson have supplied industry with well-designed and reliable pumps for every purpose.

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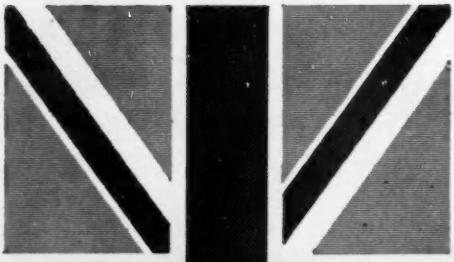
announce full scale Home Production by the end of the year

Range of silicones now available includes:



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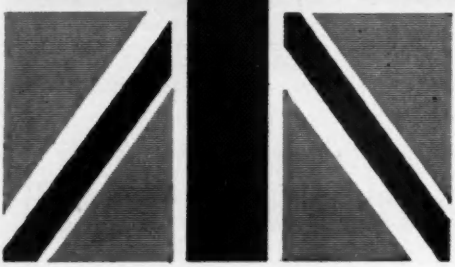

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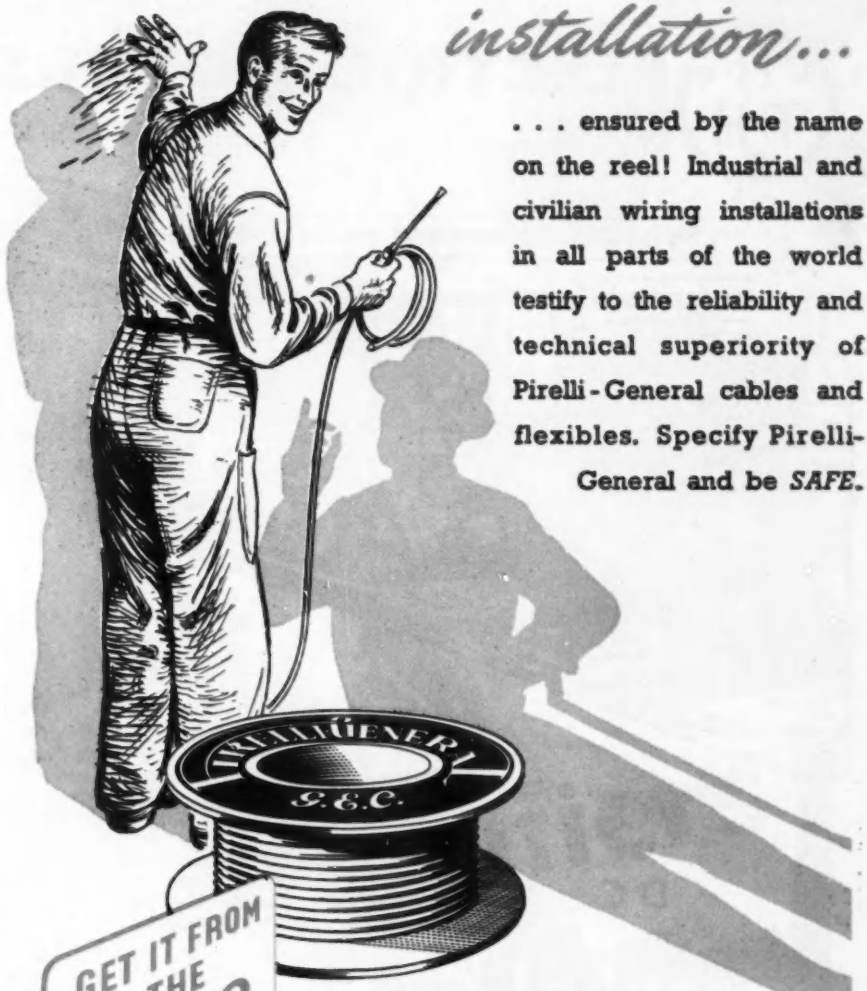

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AC Or DC

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built of KILN DRIED *timber*
STAY FLAT
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HEAVY DUTY LAMPHOLDER
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This patent bayonet holder will operate continuously at 10 amps with safety, and will reduce maintenance charges. *Specially designed for Railway conditions.*

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R&M Ball & Roller Bearings are made from an alloy steel made to exacting specification determined after years of research, which after heat treatment will ensure the greatest resistance to wear and fatigue.

Every component is subjected many times to the most scrupulous inspections before, during and after manufacture.

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BEARING COMPANY LIMITED

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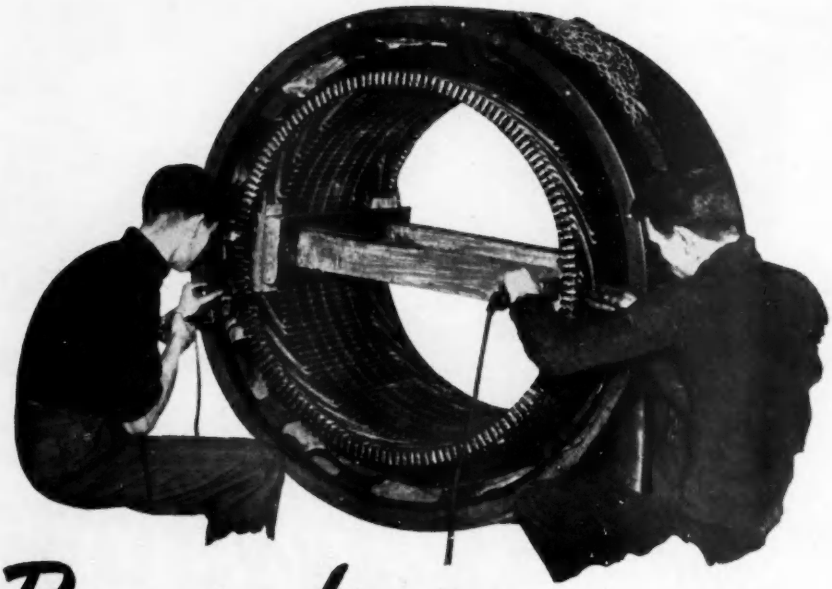

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We may not be Britain's largest electrical and mechanical repairers (we don't know), but we do have:—

Over 30 years' experience.

A staff of over 150 to give you speedy and efficient service.

A design department under the supervision of Chartered Electrical Engineers.

A large machine shop equipped with a comprehensive range of very modern machine tools.

An inspection and test department approved by the A.I.D.

Remember then, for a quick, efficient service . . .

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BROWNING'S ELECTRIC CO. LTD.

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TELEPHONE: GRANGEWOOD 4003 (4 lines)

The Modern Kitchen demands a modern B.N.E. Cooker

We are confident that in the cooker market there is no better value for money than the B.N.E. Model C.49.

It is of the popular flush-to-floor design and has a tasteful two-tone ivory vitreous enamel finish admirably suited for modern kitchen schemes. The thermostatically controlled oven, fitted with a counter-balanced drop-down door, is one of the largest marketed, and the hob is the unique B.N.E. design which permits conversion from two-plate to three-plate should the need for increased capacity arise. A capacious hot-cupboard is provided and a large storage drawer in the base is optional.

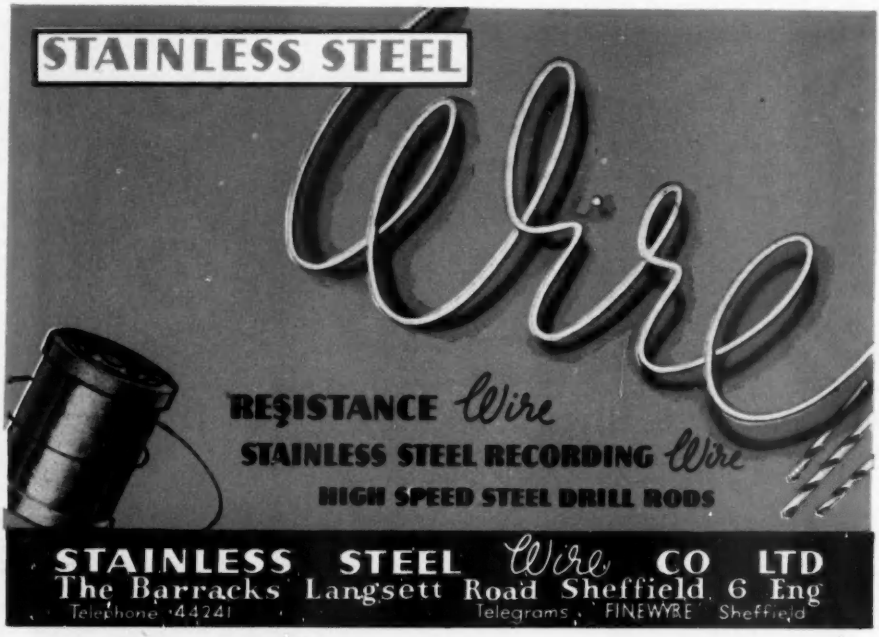
The C.49, moreover, can be highly commended for its outstanding efficiency in operation and for the many features it possesses which simplify cleaning and maintenance. Its extremely robust construction from the best materials obtainable is also worthy of note, a fact which ensures many years of reliable, trouble-free cooking.

The B.N.E. C.49 conforms with B.S.1195, E.D.A. interchangeability specifications, and British Standard Code of Practice, No. 36431.

BRITISH NATIONAL ELECTRICS LTD

The Domestic Appliance Section of Johnson & Phillips Ltd.

NEWARTHILL MOTHERWELL SCOTLAND



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TUBULAR SLIDING RESISTANCES

Zenith Resistances of proved durability are in constant satisfactory use in all parts of the world. They are available in a great variety of types and sizes, and are ideal for use in laboratories and test rooms.

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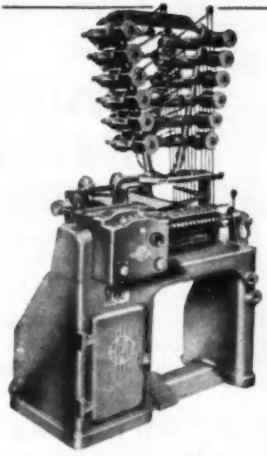

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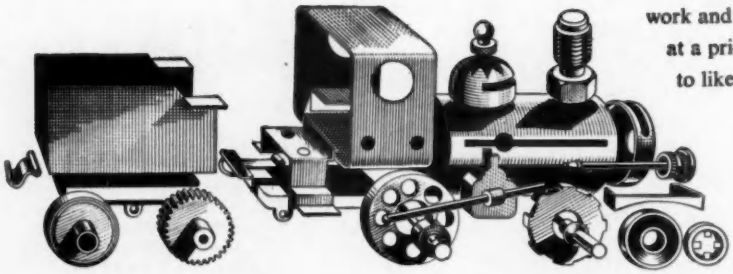

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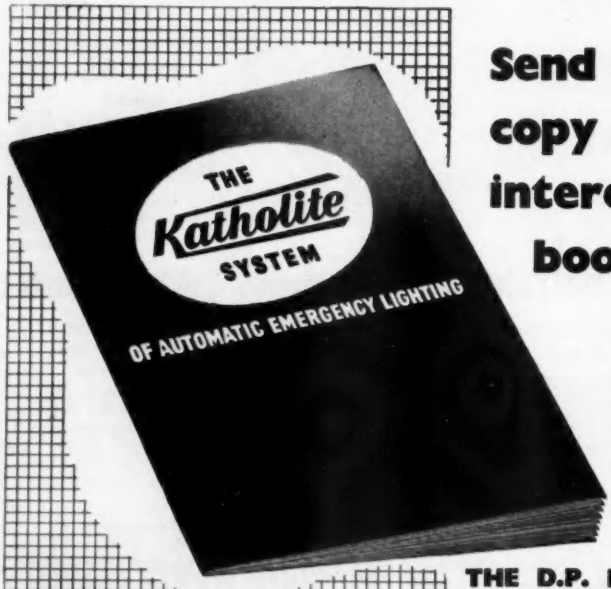

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J.248

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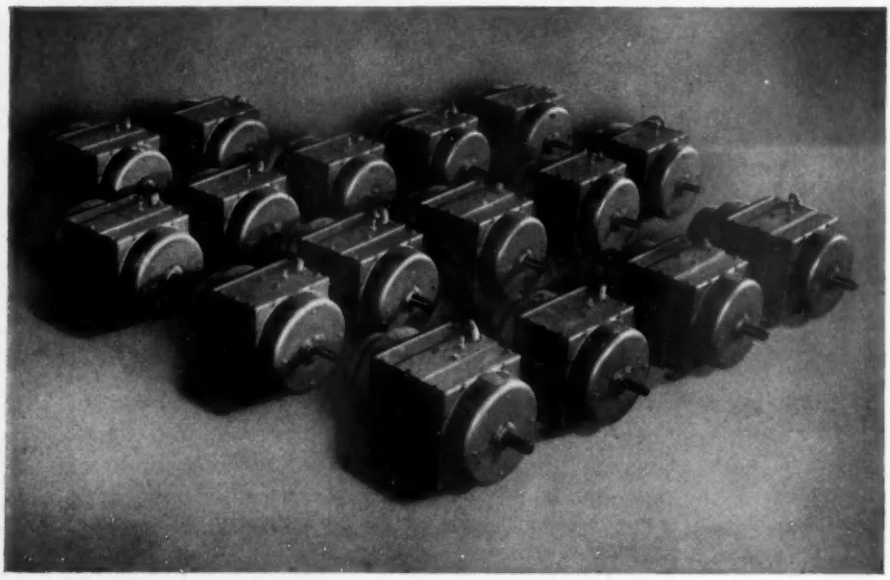

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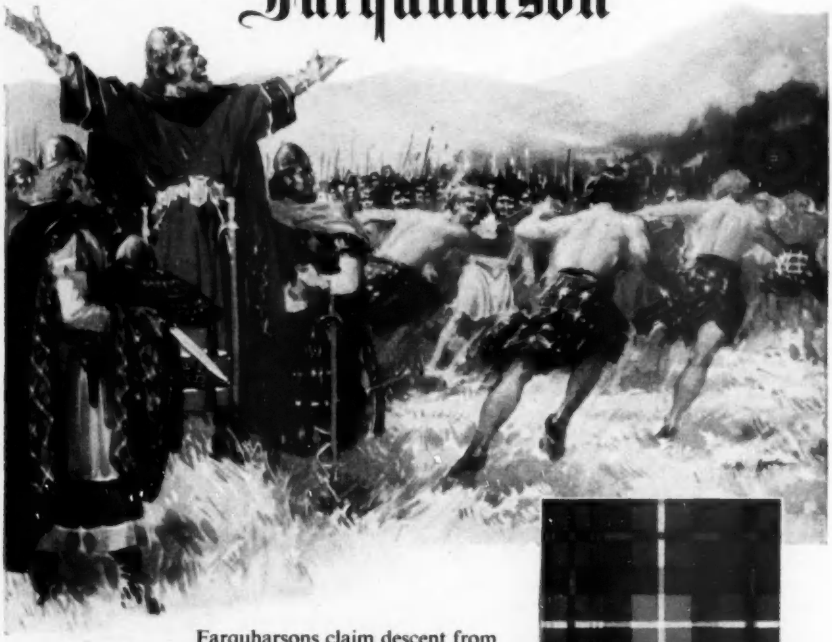

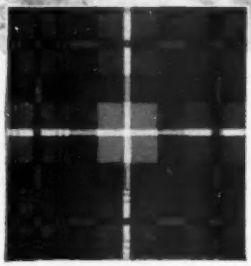

Farquharsons claim descent from the ancient Thanes and Earls of Fife, one of whom was the MacDuff who defeated Macbeth. King Robert the Bruce made Shaw MacDuff the Farquharson chief, hereditary chamberlain of the royal lands of Braemar. From the earliest times Upper Deeside has been a favourite resort of royalty. Just as Queen Victoria and later sovereigns make their way there every year, so the early Scottish Kings are said to have periodically visited this land. The great Highland Gathering still held each autumn is said to have been founded by the mighty Malcolm Canmore, who offered a prize of a purse of gold with a full suit of Highland dress and arms to the man who could first reach the top of Craig Crynoch.

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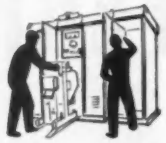
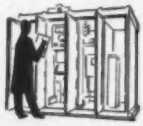


Despatched on Tuesday

Arrived on Wednesday

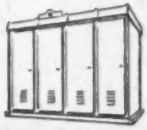
Erected on Thursday

Tested on Friday . . .



Commissioned on Saturday

In use on Sunday



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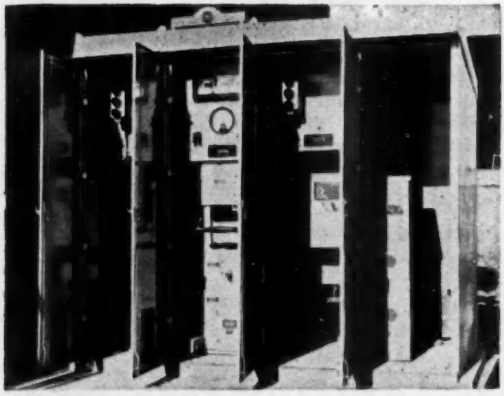

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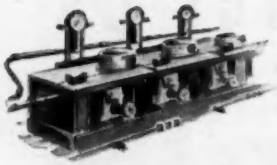
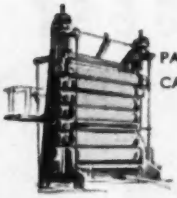


WIRE DRAWING MACHINES



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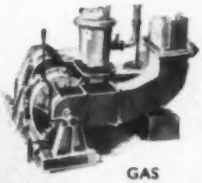

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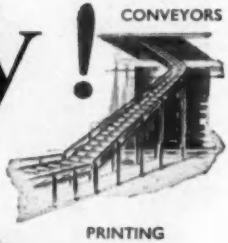

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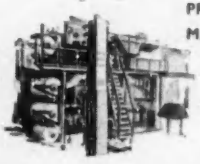

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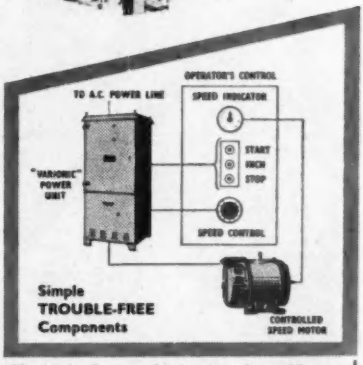

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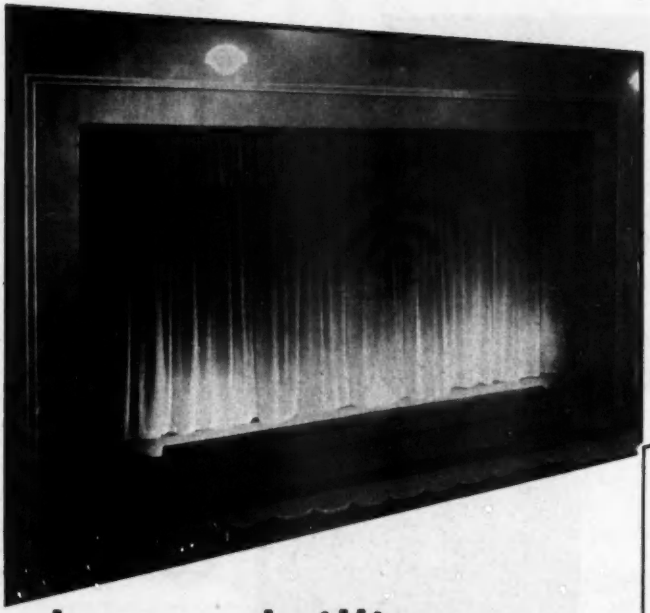

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ELECTRICAL TIMES

Volume 124 No. 3218 9 JULY, 1953

PUBLISHED EVERY THURSDAY

Editor and Managing Director:
ROY BALDWIN
M.I.E.E., Barrister-at-Law

Assistant Editors:
J. K. JOHNSON
B.Sc. (Eng.), A.M.I.E.E.

K. C. POUNDS
B.Sc. (Eng.), A.M.I.E.E., A.C.G.I.

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Editorial

FEW FIRES IN FLUORESCENTS

FLUORESCENT lamps pose a problem in protection which is not easily solved. Since the auxiliary gear incorporates a choke as an essential piece of apparatus, by reason of the impedance remaining in circuit, the occurrence of a fault to earth will not necessarily cause the circuit-fuse to blow. The shock risk may be relatively slight, due to the usual remoteness of the lamp, but at first sight, there is a danger that the choke may be overloaded by the current flowing, resulting in overheating and possibly a fire. The same risk, in some designs exists if starter switches stick. This fire danger is met in design by the provision of liberally rated chokes, but inevitably there remains the doubt whether fluorescent lighting may not add to the fire risk in a building. Happily, however, a close examination of recent fire records shows that the increased hazard is in fact very small. Although many million fluorescent tubes are now in use in this country, in buildings of all kinds, in one recent year only 48 fires attended by fire brigades were found to be started in fluorescent tubes: and in 33 of these incidents, damage was confined to the fitting itself. This suggests that no further precaution beyond careful design is necessary to meet this special problem of protection.

COAL OUTLOOK

THE summer is a time of rising coal stocks, but the question remains, are they climbing fast enough? So far they are running ominously below last year's levels, and judging from recent electricity consumption trends they need to be something like 10% higher if the possibility of a severe winter is to be faced with equanimity. It is not impossible to achieve this in the months remaining, although some lesser figure seems more probable. However, the high total of 1·4 million tons of saleable open cast coal held on site or central stocking grounds should prove a reassurance to power stations. In the absence of serious disturbance of deliveries, electricity supply should be reasonably safe for coal next winter, but from the national viewpoint there is serious alarm, on which the Minister of Fuel recently issued a grave warning. It is the familiar story of shortages in the better grades which makes it quite clear that the price structure within the coal industry is still out-of-balance and this week's tilting of coal prices in favour of lower grades is a step in the right direction. Unfortunately this adjustment is confined to household coal; it still leaves the greater industrial problem unaltered. Whatever changes are made, they may prove inadequate to deal with the winter of 1954-55, for should the weather prove inclement in the next twelve months there will be a grave running down of stocks which can only be made good by that long hoped for leap in coal production.

SCOPE FOR PROCESS CONTROL

SOMETHING in the nature of a revolution has slowly been taking place in industrial techniques, by the increasing introduction of automatic process control. This was perhaps the most important lesson to be learnt during a tour of the present Instrument Industries Exhibition. While measurement continued to be the dominant theme, many of the exhibits were concerned with that subsequent step—control, actuated by an originating measurement. Servo-mechanisms with their response systems which can be tailored to suit particular requirements, maybe applied from the simplest of controls to the supervision of complex continuous processes, perhaps more intricate than the familiar automatic boiler control. It would seem that this greater reliance on servo-control is one of industry's answers to the lack of skilled craftsmen which is so widespread today. Without these men on whom our

industries have relied so much in the past, we must inevitably turn to automatic processes that will provide the necessary close control on the quality of the finished product. There will always be a need for craftsmen of the highest quality, but ever greater reliance is being placed on the skill and technique of the machine designer who has available to him the wide gamut of the instrument-maker's art.

CHECKS ON INSULATION

TESTING insulation of electrical apparatus has progressed a long way since the early days, when the crude device of over-voltage tests accompanied insulation measurements, and visual and aural phenomena were the only available criteria of quality. The greater refinement of power factor measurement in its various forms has given good service, but has still left much to be desired, particularly for tests in the field. There has long been sought a satisfactory method of ionisation detection and with the availability of electronic amplifiers a major step was made in this direction. However it is only with the design of electronic equipment specifically directed to the detection of small discharges and other similar phenomena, that a compact and portable answer to this long standing problem has been obtained. The E.R.A. report which we summarise on a later page shows the rapid strides that are being made along these lines. Already it is possible to detect, in the laboratory and often in the field, the effects of moisture content and of minute discrepancies within the insulant.

SOLID FUEL ON TV

BY a strange chance, on the evening before the Government's announcement on sponsored TV the B.B.C., as though to demonstrate how TV advertising should be done, showed a promotional film on solid fuel appliances and gas cookers. True, the manufacturer's name was not actually mentioned in the programme, but never has a secret been more successfully disclosed. The subject of the film was the modernisation of four old houses undertaken by Allied Ironfounders, to which we referred in these notes two months ago, while the purpose behind this test was to seek a new market for their appliances in the conversion of the millions of houses that lack modern conveniences. In any such proposals electricity has an important part to play as we stated earlier, but so far as we are aware no move in this direction has been made. The film showed one other thing, that solid fuel interests are far more ready to explore the by-ways of publicity. The overall cost must have been extremely low for such a wide audience, particularly as the charges for the modernisation of the four houses qualified for a 50% Government grant.

KNOW THEY THEIR UNIT?

THOSE consumers to whom the letters "kWh" savour of the cabalistic, usually find reassurance in the homely phrase "Board of Trade unit." But is a nationalised B.o.T. unit different from a private enterprise B.o.T. unit? This is a serious question to which a correspondent writing to the *Richmond Herald* draws attention. According to his account, the Board has installed some "quick registering" a.c. meters which seem to burn much more electricity than those d.c. meters of the good old days. "Funny, isn't it?" he comments, and then to restore a more serious vein he calls for "an independent investigation into the make-up of the B.o.T. unit . . . now overdue." As the Board of Trade, which sired the B.o.T. unit, has not met as a Board since 1850 the members can have little concept of the present size of their offspring. Indeed we doubt whether the present members are aware of their parental responsibility. Could they not meet once more to answer this heartfelt plea of a consumer? First on the official list of members, the Archbishop of Canterbury could speak with authority on veracity, even of a meter, while the Speaker of the House of Commons could maintain such order as may be necessary. If all else failed, a further member, the Master of the Mint, might provide the means for this consumer to pay his electricity bill.

Meteor

Developments in Induction Indicating Instruments

MODERN DESIGNS ACHIEVE FIRST-GRADE ACCURACY

says Maj. E. H. W. BANNER,* T.D., M.Sc., M.I.E.E., F.Inst.P., M.I.Mech.E.

ALTHOUGH induction ammeters and voltmeters are less used than are those of the moving-iron type, their advantage of long scale length for a given diameter is sufficiently valuable to justify their use, provided that equal accuracy is attained. Lower than first-grade accuracy cannot be tolerated.

Up to about 25 years ago, the shaded-pole instrument was the only induction type in use in this country. This had appreciable temperature and frequency errors, with a low torque/weight ratio, and, as it could not be made of first-grade accuracy, it was far from satisfactory for commercial use. About that time two other designs were introduced, each achieving first-grade accuracy, and since then the shaded-pole has become quite obsolete in this country. Few engineers other than instrument designers are aware of these, and almost all current text-books, including recent editions, still quote only the shaded-pole type and ignore present developments, although a period of over a quarter of a century has elapsed since the shaded-pole type was dropped.

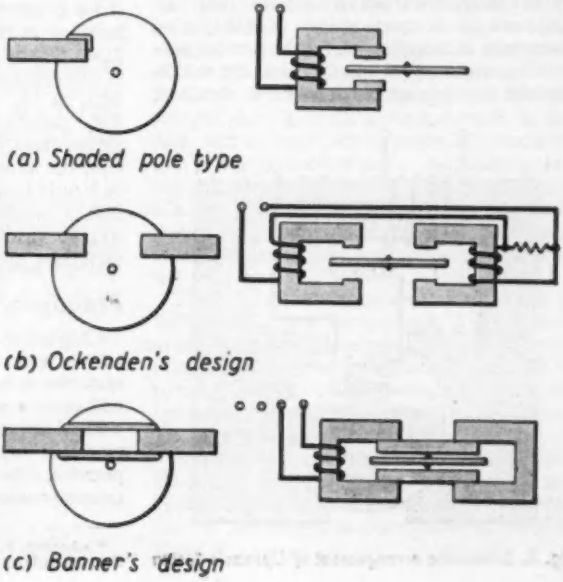
The object of this article is to give briefly the theory of induction ammeters and voltmeters, showing how present designs differ from the original shaded-pole type. Wattmeters and watt-hour meters are excluded from the scope of this article.

Fundamental Considerations

To produce motion in a conducting element by induction from an a.c. source, two a.c. fields are required, each separated in space and in time. In the shaded-pole type these two fluxes are obtained by the use of an electromagnet with an air gap, in which part of the electromagnet poles carry, due to the introduction of a conducting ring or loop at the pole, a flux through it lagging in time. In other words "shading" the pole. The maximum practicable phase angle obtainable in this design is limited to about 30°.

Later designs, however, departing from the shaded-pole, produce a much larger phase angle, together with a mechanical construction which allows a greater separation of the poles in space. All these designs require a construction which embodies effectively, two a.c. electromagnets, with a pivoted conductor in the air gap. This may be either a disc or a cylinder. Rotation of the moving element is opposed by a spring and the consequent deflection shown by a pointer on a scale. Damping

Fig. 1. Three types of induction meter are shown schematically below



*Consulting Engineer.

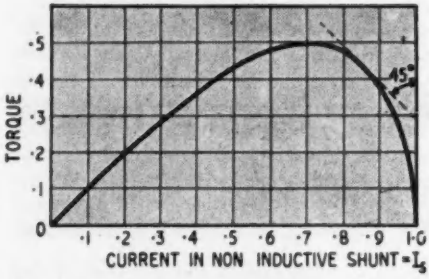


Fig. 2. Graph of torque against shunt current for Ockenden's design

is provided by eddy currents produced by a fixed permanent magnet.

As the torque is proportional to the square of the current, the scale law is also a square law, resulting in a scale cramped at the lower end if a constant-radius disc is used. It is, consequently, usual to shape the disc or cylinder so that less metal is in the air gap as the deflection increases. In this way a nearly linear scale is produced which is better for ammeters, but is not necessarily so for mains voltmeters.

Shaded-pole Type

In the original shaded-pole type of instrument the separation of the adjacent pole faces was slight. Currents induced in the disc reacted and thus produced a lateral movement, which, by the construction became a rotation (Fig. 1a). Although the complete theory of this type of instrument is complicated, for the present purpose it can be resolved into the simple expression that the torque is proportional to $\Phi_1 \Phi_2 \sin \theta$, where Φ_1 and Φ_2 are the respective fluxes, and θ the phase angle between them. Both the shading ring (of copper) and the disc (of aluminium) have resistance and inductance, and the temperature coefficient of resistance is not negligible for either. The greater the phase angle (which in any case cannot be much), the smaller will the secondary flux be.

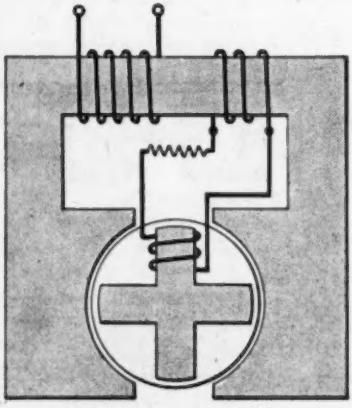


Fig. 3. Schematic arrangement of Lipman's design

Ockenden's Design

A design, originally due to Ockenden, produces a greater separation in space by virtually splitting the electromagnet into two parts, one acting directly, and the other, corresponding to the shaded pole, mounted end-on to it. Both react on the moving disc. The flux in the second electromagnet is caused to lag by shunting the winding, the combination being in series with the first winding (Fig. 1b). Depending on the amount of current shunted, the lag in phase of the flux Φ_2 compared with that in the unshunted electromagnet Φ_1, can be made of any desired value, and Ockenden* shows that, to a first approximation, torque is a maximum when θ is 45°. An improvement occurs when θ exceeds 45°, and if this can be made 60° ($\sin \theta = 0{\cdot}866$) optimum performance is found, according to Ockenden, who takes into account the change of disc resistance with temperature, and the drop in torque with increase of shunted current. This situation is shown graphically in Fig. 2, where the proportion of current in the non-inductive shunt is shown as it varies with torque. If the proportion is increased to 0·866 (corresponding to an angle of 60° between the two fluxes Φ_1 and Φ_2) then the tangent to the curve at this point on the graph is 45° and the torque falls, as "I_s," (the shunted current) increases. If the material of which the shunt is made has a temperature coefficient similar to that of the disc, the alteration in the induced current will be largely balanced by the corresponding variation of shunted current, so that the instrument will be virtually independent of temperature variations over a wide range.

Frequency Effects

Changes in frequency will vary the shunted current by an amount proportional to the variation of volt drop across the inductive coil, and will also vary the disc induced currents by a similar amount. Thus there is an inherent tendancy to reduce the frequency error. In practice, the overall temperature error is generally about 0·03% per °C. and the fre-

*Ockenden, F. E. J. "The Induction Ammeter," *Elec. Rev.* 101 (1927), 173-4 and 215-16.

quency error is usually in the neighbourhood of 0·2% for a 10% change in frequency.

The ammeter has been specifically dealt with, but the addition of a non-inductive series resistance of negligible temperature coefficient produces a voltmeter of similar characteristics. The frequency error is then even lower, since the total winding between the terminals is almost non-inductive. A 6-in. ammeter of this type has a consumption of 5 VA with a high torque/weight ratio of 0·2.

Banner's Design

Another design, of about 1930, due to the author,† also employs two opposing electromagnets. One is wound and connected in the circuit and the other is coupled to the first by two copper loops embracing adjacent pairs of pole faces (Fig. 1c). There is thus a transformer coupling between the two cores, the angle of lag between Φ_1 and Φ_2 being about 150° but varying with temperature and frequency. This angle being variable it can be made to provide automatic compensation for temperature change to a large extent. As before, torque is approximately equal to $\Phi_1 \Phi_2 \sin \theta$, and maximum torque occurs when $\theta = 90°$. Consequently, as θ becomes less on heating than its nominal value of 150°, it approaches 90° more and more, resulting in a higher torque as the temperature increases the disc and coupling loop resistances, thus decreasing θ and reducing eddy currents which in turn reduce the induced current.

Practical Tests

Experimental tests with search coils and an a.c. potentiometer showed that Φ_2 was approximately 60% of Φ_1. Temperature tests showed an error of 0·08% per °C., reading low with increase of temperature. The self-heating error was 0·6%.

Frequency error is not inherently compensated, but a non-inductive shunt across the exciting coil can be adjusted so that an increase in frequency will result in less current through the coil. In practice a coil current of 3·2 A for 5 A line current provides adequate compensation, resulting in a frequency error of 0·04% per c/s change. When this shunt is of copper it has negligible effect on the temperature error, as the whole circuit is of copper. As a voltmeter, using a high series resistance, the circuit is effectively non-inductive and no appreciable change in temperature and frequency error results from using the instrument in this manner.

†Banner, E. H. W. "An Induction Instrument," *Elec. Rev.* 142 (1948), 548-50.

Lipman's Design

Although this instrument was developed earlier than the two designs quoted above, its radical difference in construction from the shaded-pole type has made it convenient to deal with it last. The design, an outline of which is shown in Fig. 3, comprises a fixed laminated electromagnet energised by a winding wound for current or voltage. In the air gap is a fixed cruciform core: on one of the limbs at right angles to the main magnetic flux axis is a winding which is excited from a secondary winding on the main core, through an initially adjustable resistance. Thus two magnetic paths at right angles in space are produced. In the air gap is a pivoted cylinder of aluminium which is cut by the two magnetic fluxes, the consequent reaction producing torque. Maximum torque is proportional to the produce of the two fluxes and the sine of the angle between them, as before. The phase of the secondary flux, in relation to the primary flux, can be varied over a range by varying the series resistance. Its variation also controls the temperature and frequency error, somewhat as for Ockenden's design. In practice, for a given combination of windings, the resistance is finally adjusted to give full-scale deflection with the appropriate value of current (or voltage), the air gap remaining fixed.

Design Features

The main features which should be noted in this design are the constructional symmetry and the disposition of the windings for maximum efficiency, which result in high torque, combined with the low temperature coefficient of 0·015% per °C., and a frequency error of 0·4% for 10% frequency change. As for other designs, shaping of the moving element, in this case, with constant radius, results in a modification of the square-law scale. Accuracy is thus well within first-grade. In addition to 6- and 8-in. instruments this design is regularly made in 4-in. size. Two or more of these instruments combined in one case form a useful long-scale test-set.

The most recent design appears to be that of Salford Electrical Instruments, Ltd., a first-grade instrument employing a modified watt-hour meter movement connected with coils in parallel, with a compensating resistance for optimum phase-angle between the two fluxes. The theory has not been published.

Acknowledgment is made to Messrs. Everett, Edgcumbe and Co. Ltd., Ferranti Ltd. and Nalder Bros. and Thompson Ltd., for information on the respective instruments for publication.

Electrical Faults are Less to Blame for Fires

FIRES cause a total direct loss every year of about £24 million; and one in every six over a period of years has been associated with electricity. These facts quoted from the Report of the Director of Fire Research highlight the importance of any improvements that can be effected. Yet they do not necessarily indicate a direct electrical danger, as the strange case of electric cookers shows.

In each of the years 1949 and 1950 some 700 fires associated with electric cookers were reported. This alarming figure prompted H.M. Senior Electrical Inspector of Factories, who is also Advisor to the Home Office on the safety of electrical appliances, to request a detailed analysis of the origin of these fires. This showed a very different story from that suggested at first sight. In the 814 incidents investigated, only six fires were attributable to electrical defects in the cooker, its leads or its switches! All the rest—the vast majority—were due to the burning of food or other incompetence on the part of the owner.

Improved Design

Sometimes, however, the electrical cause of trouble is more definite, as in the case of wireless and television sets. Yet here again, what began to look a serious weakness is now shown in a better light. In 1947 the annual rate of incidence of fires in television sets was 6·4 per 10,000 sets at risk. By 1951, the figure was down to 1·0, and the drop had been steady. It is considered by fire engineers that this decrease is largely due to improvements in the design and layout of the newer sets, which form an increasing proportion of the total number of sets in use.

Temporary dwellings continued in 1951 to have a higher incidence of fires than in other buildings, and the actual incidence increased. Although this cannot be attributed to any one cause, it is considered clear that fires associated with electricity represent a fair proportion of the total. Once again, the limitations of "associated with electricity" must be borne in mind, but even considering this it seems likely that the high rate of incidence of fires caused by the use of electricity in temporary dwellings is, in part, due to the greater use of electricity in these.

Finally, attention may be given to fluorescent lighting. A detailed analysis was carried out of 48 fires starting in fluorescent fittings, which were attended by fire brigades in 1951. Of this total, 15 started in chokes, 14 in transformers, three in resistances, four in wiring and three in condensers. In 33 of the fires, damage was confined to the apparatus and to the room of origin in six. There was only one serious fire, in which damage was caused to a bookshop.

Fire Research Board

In the report of the Fire Research Board, which is published with that of the Director, complaint is made that with the staff and accommodation available it is not possible to give adequate attention to research items even of the highest importance. In particular, staff numbers have not yet reached the totals originally envisaged, and the Board urges that as soon as possible authority should be given for the necessary recruitment.

In view of the high costs incurred by many organisations for fire protection services, it is of interest to note that nearly half the total fire losses (financial value) are caused by less than 0·3% of the outbreaks attended by fire brigades. Statistical research emphasises the importance of adequate fire-cover in reducing damage.

CAUSES OF FIRES IN BUILDINGS

Supposed cause of fire	1947	1948	1949	1950	1951
Electric cooker	394	444	744	740	784
Fire, heater, etc.	1,195	893	900	1,092	1,180
Iron	384	356	436	372	364
Motor	383	280	180	264	310
Refrigerator	557	789	1,108	1,132	1,020
Wire and cable	2,598	2,353	2,680	2,250	2,694
Wireless and television	243	365	444	450	548
Other apparatus	540	540	736	906	948
Static electricity	22	19	24	22	32
Miscellaneous and unknown	4,456	4,755	5,600	5,798	5,820
Total fires in buildings	37,278	37,246	42,792	43,744	42,394

Power for Italian Liners

Some Recent Installations are described in this article

By ANTONIO GIORDANO

THE construction of large passenger liners such as the *Andrea Doria*, *Augustus*, *Giulio Cesare*, *Victoria*, *Asia* etc., which have extensive air conditioning plants installed throughout, has placed before the Italian shipbuilding industry, in the course of the past few years, the necessity of designing powerful electric power stations for use afloat. As a matter of fact, on the turboliner *Andrea Doria*, the electric plant has an installed power of about 6,500 kW against an original forecast of 3,500 kW! Further, steps have been taken to prevent interruption of the power supplies by using three independent generating centres. On the turbine-driven liner *Andrea Doria* the main generating centre comprises five diesel-electric sets each of 750 kW rating, the auxiliary units consisting of two steam-electric generating sets of 1,000 kW each, in the main engine room.

Main Installation

The main generating centre on the *Andrea Doria* is situated forward of the main boiler room, and is provided with independent switch board from which may be operated the five diesel electric generators. These consist of five dynamos of 750 kW each providing 220 V d.c. at 250 r.p.m., each driven by four-stroke Ansaldo Diesel engines working on the single acting principle. These engines have seven cylinders and are rated at 1,200 h.p. each. For pumping the cylinder cooling water, three electric pumps with a capacity of 250 tons/hour are provided, and of these two are sufficient for the operation of four diesel engines at full load, the third one being held as stand-by. The diesel plant is completed by two electric air compressors for providing starting air. These have a capacity of 100 cubic metres/hour of air with a pressure of 30 kg/sq cm (430 lb/sq. in.).

In addition, as outlined in the beginning of these notes, in the main engine room of the turboliner *Andrea Doria* there are two steam generating sets each consisting of a turbine coupled to a dynamo with an output of 1,000 kW giving an output at 220 V d.c. at a speed of 700 r.p.m. The steam for these turbo-electric generating sets is supplied from the main boilers. They are designed to work with superheated steam at a pressure of 36 kg/sq. cm (500 lb/sq. in.) at a temperature of 450° C. Each turbine is coupled to the dynamo shaft by means of single reduction gearing with a ratio of 1 : 8·6.

The electrical installation also includes an emergency electric set of 150 kW at 220 V d.c. driven by an Ansaldo diesel engine of 240 h.p.

An entirely new technique is, however, to be followed in the construction of the electric power plant on the turboliner *Cristoforo Colombo* of 20,000 gross tons launched on May 11, 1953, from the Cantiere Ansaldo of Genoa Sestri. For the first time in the history of the Italian shipbuilding industry, three-phase, 440 V, 60 c/s electric power is to replace the 220 V d.c. This liner will have three electric centres with a total power of something like 7,500 kW distributed between three steam electric generators of 1,200 kW, four diesel electric generators of 750 kW and an emergency set of 150 kW.

The generating centre in the Andrea Doria showing the diesel units and the main switchboard

Farming pays— the electrical way

Royal Show indicates the value and variety of electrical equipment for use in agriculture

ADDED emphasis is given to electrical equipment being shown at this year's Royal Show, which opened last Monday at Blackpool, by virtue of the recent Governmental announcement that an additional £1½ million was being allocated to rural electrification. As in previous years, a wide variety of electrical equipment and appliances are displayed. Moreover, a greater number of manufacturers, 620 as against 570 last year, are showing equipment, not a little of which is of electrical interest.

Decorated with its attractive Coronation Year theme, "Electricity Farm," the joint stand of E.D.A. and the North-Western Electricity Board, sets the electrical scene for the agriculturalist. Equipment on show represents almost every aspect of electricity in farming, particular attention being paid to commercial horticulture, in view of the activity in this field in the north-west. In the dairy section modern mobile milking machinery is on view, together with thermal storage, steam raisers and chilled water milk coolers. Powered equipment, in the form of pump, barn and workshop machinery, demonstrate the value of electrical energy, cleanliness and silent operation. Poultry farmers are not forgotten in a display showing electrical applications in the deep litter method, and for lighting to increase winter egg yield. And "Electricity Farm" would not be complete without its domestic appliances, of which a wide range is being shown to aid the task of the farmer's wife.

Barn Machinery

Exhibits of barn machinery vary from mash mixers to grain elevators. Among the former may be seen that shown by Whitlock Bros., having a capacity of up to 10 cwt of mash or 7 cwt of grain, and powered by a 5 h.p. motor. On removing agitators fixed to the worm at the cone base, however, the latter capacity is increased to 15 cwt. On this stand may also be seen grain elevators electrically powered and a portable grain conveying unit. Also showing mash mixers are W. L. Holland Ltd., with their "Adelphi" units, all of which may be electrically powered.

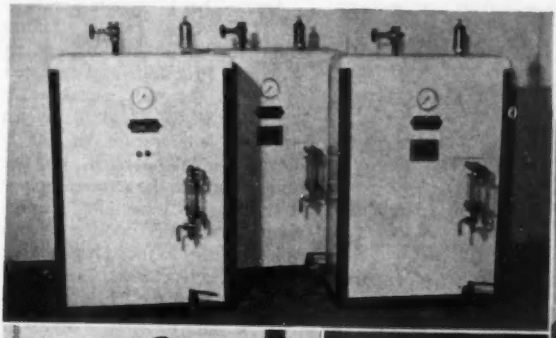
Grain milling equipment is being shown by Bentall and Co., who display their "Wizard" automatic mill, designed for any variety of cereal. Powered with a 3 h.p. motor, the mill is fitted with a chilled cast-iron rotor, and can be converted to a hand-fed chaff cutter. Also showing in this section are Scottish Mechanical Light Industries, with their "Electromatic" fan-type hammer mill. Its vertically mounted motor—3 h.p. single-phase or 5 h.p. three-phase—forms the pedestal of the mill. Automatic power cut-off is provided by a relay, operating when the motor current falls consequent upon cessation of the grain flow. Mitchell and Coleman feature their "Spirolift" pick-up grain loader, powered with a 2 h.p. motor, whilst a pneumatic grain conveyor, using a 3½ h.p. motor and stated to handle 30 cwt. of grain/hr, is displayed by Air Control Installations.

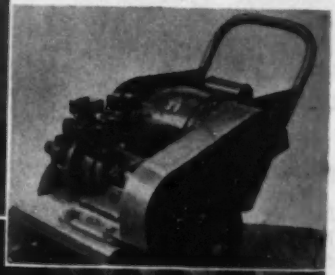
Grain Driers

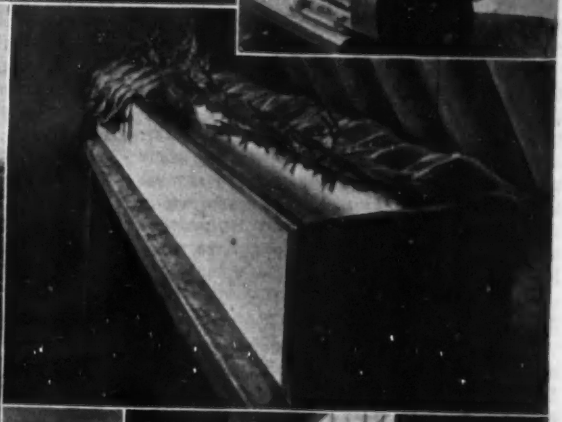
For grain drying, G.E.C. show units for both platform, silo and in-bin units. Of interest to the farmer with a small corn acreage, are their platform driers, which although designed for wheat, may be used for barn hay drying, and with modifications, for drying grass and other herbage crops. These units employ Woods propeller and Aerofoil fans, powered by totally enclosed motors, with G.E.C. duct air heaters, and may be supplied for either vertical or horizontal mounting. Geo. W. King Ltd. are featuring their "Thermatic"

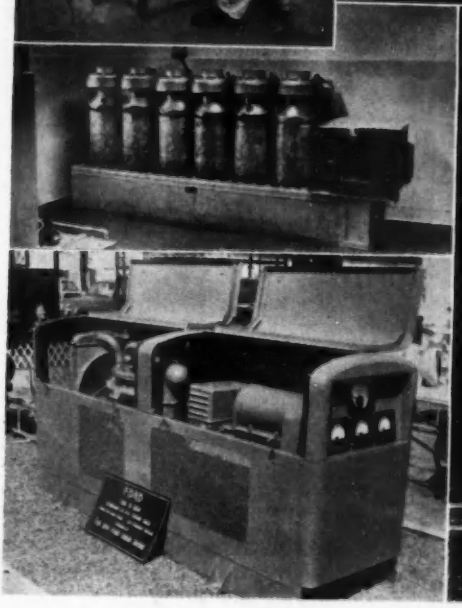
On the opposite page are seen, top left, 3 Perkins' 18 kW rating "Power" steam boilers, and right, a "G.G.G." portable h.p. pumping unit. Centre left shows the Whitlock mash mixer, next to it being the "Chickchilla" poultry chiller by Frigidaire. Lower left are shown the "Rotorfreeze," Gascoignes ice-bank milk cooler and below it A. C. Morrison's 25 kVA alternator driven by a Ford diesel. Bottom right is the G.E.C. vertically-mounted platform grain drier

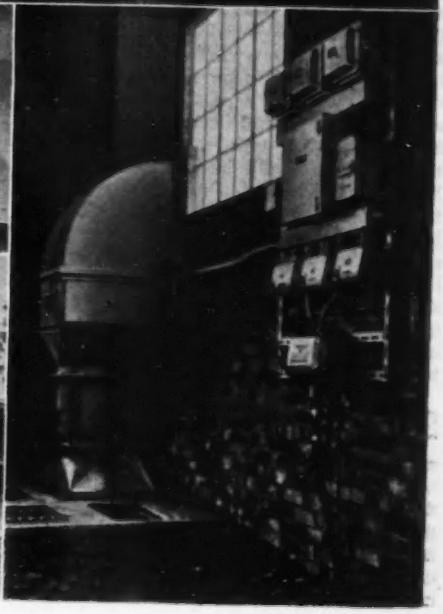
SOME EXHIBITS AT BLACKPOOL

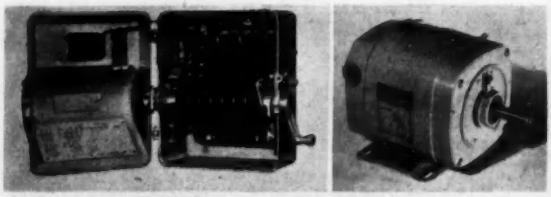












Left, Brook Motors' new hand-operated drum type starter, whilst a Hoover f.h.p. motor is seen on the right

electric grain driers and conditioning plant.

Motors for general power application in farming may be seen exhibited by Brook Motors, in which is a recent drip-proof type, constructed to B.S. draft specification C.N. (ELE) 6814. Also on view here is a newcomer to the Royal Show, a hand-operated star/delta starter of the drum type, designed for use with three-phase motors up to 15 h.p. in size. A range of fractional h.p. motors having many uses for farm equipment is featured by Hoover Ltd. Pumps, incubators, shearing equipment, dairy equipment, are some of the possible application for these units whose sizes range from ¼ to ½ h.p.

Equipment for the Dairy

For the dairy farmer there is a comprehensive variety of equipment on show. Melotte Separator Sales Co. display their "Surge" milking machine, whilst the Simplex Dairy Equipment Co., also showing milking machines, are featuring a new type of impulsator, driven by electric pulsation from a 12 V d.c. motor.

Among the variety of milk-cooling equipment on show is an in-churn cooler by Purlac Ltd. Of the iced-water type, this unit is made in three sizes, to handle milk quantities of 100, 150 or 200 gals/day and may be fitted with a tray for either two or three churns. The Pressed Steel Co. display their "Prestcold" "C.W." series chilled-water type cooler, in which the ice "bank" principle is utilised. Fully automatic refrigeration units of "Prestcold" manufacture are used, three sizes, up to a maximum milk capacity of 250 gals/day, being available.

In-churn milk coolers are also shown by Gascoignes (Reading) Ltd. Known as the "Rotorfreeze," their units are available in a range of sizes, using ¼, ½ or ¾ h.p. condensing units. Utilising the ice-"bank" principle, these coolers are built up round a low-level ice tank, in which, over a period of eight hours, ice is formed, to be melted during the cooling of milk from 90° F to 50° F approximately, in one hour.

An ice-"bank" system is used in the "Eldwood" water chilling units for milk cooling, being shown by Frigidaire and designed to reduce the milk temperature from 92° F to 42/44° F in an ambient temperature of 90° F during two daily periods. For the poultry farmer, the same company is showing "Chickchilla" equipment for rapidly cooling newly-killed poultry to prevent greening.

In the range of "Electrochurns," made by the Churn Co., may be seen the "Electrochurn Minor," of churning capacity 2 to 10 pints, in which the entire process of butter making, washing and salting is electrically powered.

Another aspect of electricity for dairy farming is to be seen in the "Power" electric steam boiler displayed by Perkins Clean Milk Equipment Ltd. These units, of which nine standard sizes are made, ranging from 9 to 72 kW, are constructed for working pressures of from 1 to 30 lb/sq in.

Among poultry farming equipment on show is a large variety of incubators, in which electricity is particularly suited. Mayfair Incubators manufacture three sizes of their unit, of which the largest has a hen egg capacity of 2,240, falling to 1,530 for turkey or duck eggs.

Cabinet type incubators are shown by Papworth Industries, Ltd. These, using strip type heaters of 500 watts each, have total

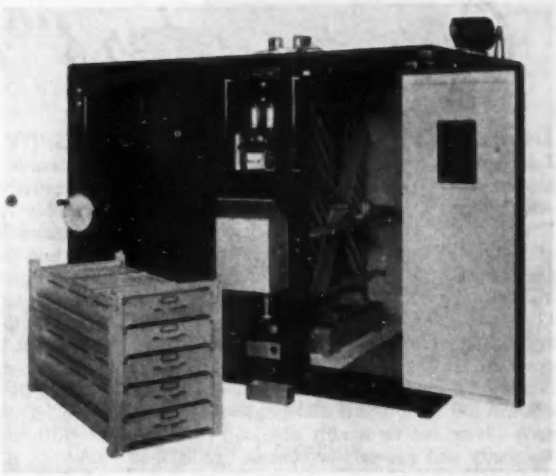
Mitchell Coleman's "Spirolift" is a useful application of electricity

capacities from 6,500 to nearly 1,500 eggs. A 1/3 h.p. motor powers the fan. For the smaller poultry farm is a newly introduced 1,000-egg cabinet incubator shown by Stephens' Cabinet Incubator Co., having a total loading of 600 W.

Other applications of electricity in poultry farming are seen in the cafeteria laying battery, which the Visi-Chick Brooder are showing in their quick feed cage. This company is also displaying the "Visi-Sunray" 500 W electric heating unit, for use with their brooders.

Small power tools, for use in and about the farm, are a feature of the Tarpen Engineering Co. For the workshop is their "Tarplaner," and electric jack-plane, whilst the "Hedgemaster," run from a 400 W generating set, can be used for hedge trimming. There is also the sheep shearing and cattle clipping machine shown by the Wolseley Sheep Shearing Machine Co. This company has also on view other electric equipment, among which is a range of fencing accessories for use with the "Bell Shape" electric fencing system. Another fencing system is the "Portapylon," featured by the Harvest Saver and Implement Co. Here the emphasis is on easy erection and moving for strip grazing. The supply is derived from a 6 V car battery and is of the inductive discharge type, operating at 60 impulses/min.

Fencing wire is shown by Bayliss Jones and Bayliss, whilst Stewarts and Lloyds display a variety of steelwork for agricultural applications. Plastics for farming is the centre piece of I.C.I. (Plastics) exhibit.



Here is a Papworth's 175 incubator showing fan and water drip

Power Equipment

Larger powered equipment on show includes electric motor-driven pumps, among them being a portable unit shown by Gilbert Gilkes and Gordon. This, a "G.G.G." heavy-duty, self-priming unit, can be used wherever high-pressure hosing is necessary; delivering water at 85 lb/sq in. pressure, powered by a motor up to 3 h.p. rating. A 1½ in. pump is shown in operation, powered by an Arthur Lyon and Co.'s "Stamford" motor.

John Beresford have their submersible electric pump for raising water from wells or boreholes, and also a pumping unit. The automatic pressure water system provides the country dweller with the equivalent of a town mains water supply. Another exhibit in this sphere is Worthington-Simpson's pressure tank set, comprising a ½ h.p. "Domestic" pump, coupled to a 30-gallon water tank. Control of this system is automatic to ensure the tank is constantly replenished.

Power generating equipment, a necessity for the farm without an electricity supply, is an important section of the Show. In this sphere is found R. A. Lister "Start-O-Matic" sets, rated from 2·5 to 7·5 kW, whilst Bamfords Ltd. have a remote controlled 230 V, 4 kW, single-phase, diesel-driven alternator set. For larger power requirements is the 25 kVA alternator, powered from a recently developed Ford diesel engine, displayed by A. C. Morrison (Engineers) Ltd. Arthur Lyon and Co., in addition to their 5 kW set, show a 2·5 kW, simplified, diesel-driven unit. Petters Ltd. have a range of petrol and diesel engines, including a new, small-power diesel, the PAZI, developing from 1½ to 2½ b.h.p. By way of contrast is the Lucas "Freelite" wind-driven generator, providing a 24 V supply for lighting.

No description of the Royal Show would be complete without reference to domestic appliances for the farmhouse. Here may be seen Kenwood Electrics' "Chef" which, primarily a food mixer, may be modified to perform many other kitchen tasks. Here, also, is seen Hoover's new washing machine, with its increased capacity, and G.E.C.'s drop-door cooker, and 3 cu ft table-top refrigerator.

Our readers' views . . .

Danger from Fuel Advice

IN an editorial article in your issue of the 2nd July, you suggest that there is a danger lying hidden in the proposal of the Pilkington Report on a National Fuel Efficiency Company that the latter should offer advice to such commercial and other fuel users as are not catered for by my Council's activities in the domestic field. You assume that this implies that the Coal Utilisation Council is regarded officially as the appropriate source of advice on any form of domestic heating. This is certainly not the case. Nor should we dream of offering advice on the efficient use of electricity and gas, knowing that such advice can be readily obtained from the electricity and gas service centres. Indeed, it sometimes happens that we receive enquiries from members of the public who contemplate using solid fuel in circumstances in which, in our view, electricity or gas would be more suitable, and in such cases we always advise the enquirer to visit the appropriate electricity or gas showroom.

Eric Bellingham
DIRECTOR-GENERAL
COAL UTILISATION COUNCIL

(The article referred to the possibility that C.U.C. centres should be used to meet the recommendations of the Ridley Report. We are glad to have Mr. Bellingham's reassurance on this matter.—ED.)

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Electric Razors—and Safety

WHILE I agree that the Chilton Products multi-way socket is a convenient way of getting over the problem of American and Continental type plugs, I do not feel that it offers solution to the difficulty of "Hotels Engineer" (your issue of May 21) which is primarily based on the fact—as it appears to me—that an unearthed appliance is being used in direct contact with the human frame in a situation which is not earth-free.

The only suggestion that I can make towards the solution of this problem—which as an electric razor user myself I find somewhat worrying—is to place the appropriate socket outlet system, together with a lighted mirror, in some part of the room which is effectively earth-free. Providing the wiring is carried out in non-metallic conduit and due care is taken in the selection of the position no trouble should arise.

"Logic"
LONDON, W.C.2

Small Portable Tools

DESPITE Mr. Kingsbury's amplification of his case in the issue of June 18, for some form of restrictive legislation on the use of small portable tools, I still feel that the faults he mentions are the exception rather than the rule and that he has been particularly unfortunate. Further, I feel the whole onus lies on the manufacturer. Motors are made that will stand up to 240 volts on the windings indefinitely, and it is up to the manufacturer to ensure that his products are electrically sound on leaving the works.

Incidentally has Mr. Kingsbury any idea of the form that his "restrictive legislation" might take?

Handyman
ROMFORD

◆ ◆ ◆

"M.C.R." Meters

IT has been pleasing to learn of the adoption of such reforms in meters as marking them with their maximum continuous rating values and with the year of manufacture against the serial number—changes which I advocated in my 1944 I.E.E. Paper "Planning the Future Electricity Meter."

The reference in your columns lately to recent regulations made under the Meters Act for the testing of m.c.r. meters shows that these meters are now "accepted." In my earlier experience I found myself much in sympathy with those concerned in the fixing of meters, for in an electricity supply undertaking which, over the years, had purchased a variety of makes, it was necessary to bear in mind that the marked amperage might need to be qualified. In conscientious meter-fixing, multipliers of 1, 1¼, 2 or even 3 would be applied in suiting a particular meter to the installation. And the coming of L.R. (long-range) meters marked with a nominal rating did not ease matters. It may be added that in stocking, testing and history-recording too, the situation was anomalous.

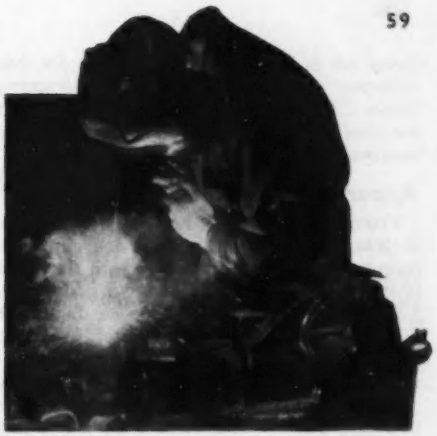
As I have left the field of my earlier experience I do not know whether my forecast of 1944 that existing meters would be re-marked in m.c.r. values is coming true, but I sincerely hope that such rational steps will be taken generally.

G. E. Moore
DARLINGTON

P.F. Correction *for* Welders

Determining the Optimum Rating of Capacitors described

by **F. P. MEADOWS, B.Sc., A.M.I.E.E.**



THE characteristics of the electric welding load may be summarised as a highly intermittent single-phase current associated with a low lagging power factor. Owing to the fluctuations produced, these features have a high nuisance value to the other consumers and the supply authority derives very little revenue having regard to the disproportionately high currents that have to be supplied.

Apart from the introduction of a motor generator between the welding machine and the supply mains, there is no way of eliminating the fluctuations, but they may be moderated and the magnitude of the current drawn from the mains reduced by a capacitor connected across the terminals of the welder. It must be remembered, however, that the capacitor will take a leading current during the whole time the machine is in use, whether the arc is struck or not, and consequently that no-load current is a purely leading one which can, if the capacitor is too large, be equally objectionable.

It will be appreciated that this circumstance is most likely to arise with a machine of very low power factor requiring in consequence a comparatively high degree of correction.

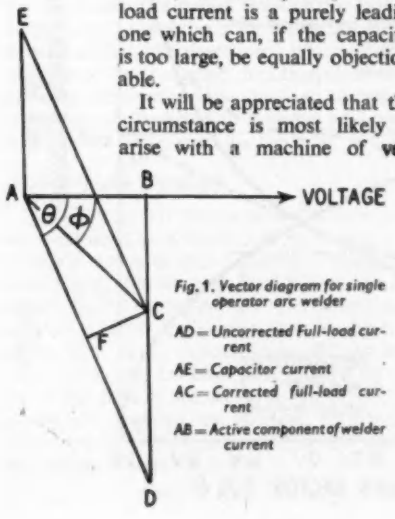


Fig. 1. Vector diagram for single operator arc welder

AD = Uncorrected Full-load current

AE = Capacitor current

AC = Corrected full-load current

AB = Active component of welder current

Capacitor Criterion

One may formulate the rule, therefore, that the capacitor should be such as to correct to unity power factor at full load, provided that the leading current at no load does not exceed the corrected full load current, in which case the capacitor should be only such as to equate the full load and no load currents.

This condition applies also with the single operator arc welder with its power factor of 0·35-0·4, and is illustrated by the vector diagram in Fig. 1. It will be seen that the current vector swings considerably from its position AC at full load to AE at no load, although its magnitude is appreciably less than that of the uncorrected full load current AD. The locus of the vector at intermediate loads is the straight line CE.

The corrected or improved power factor $\text{Cos } \varphi = \frac{AB}{AC} = \frac{AB}{CD}$. CF is drawn perpendicular to AD, whence from similar triangles

$$CD = \frac{FD}{\text{Sin } \theta} = \frac{\frac{1}{2} AD}{\text{Sin } \theta}$$

Substituting for CD above,

$$\text{Cos } \varphi = \frac{AB}{AD} \times 2 \text{ Sin } \theta$$
$$= 2 \text{ Sin } \theta. \text{ Cos } \theta.$$
$$= 2 \text{ Cos } \theta \sqrt{1\text{-Cos}^2 \theta.}$$

Where Cos θ = uncorrected power-factor. The resultant full-load current and the no-load current are each equal to $\frac{\text{Cos } \theta}{\text{Cos } \varphi} \times$ uncorrected full load current. The kVA ratings of the capacitor and welder are in similar ratio, which can be expressed as $\frac{1}{2\sqrt{1\text{-Cos}^2 \theta.}}$

Curve AB in Fig. 2 gives these ratios for uncorrected power factors from zero to unity. Curve CD is obtained by plotting against uncorrected power factor, the corrected or improved power factor.

Apparent Anomaly

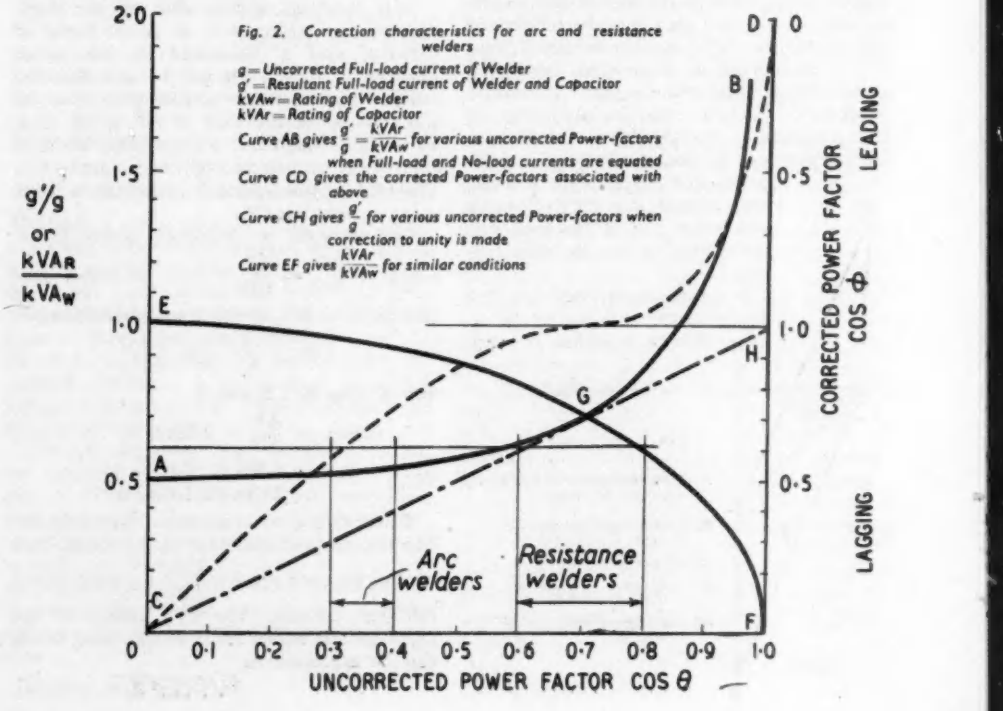
From curve AB may be seen the anomaly in this method of calculating the capacitor rating, as this rating increases with the value of the initial power factor instead of decreasing. For a hypothetical initial power factor of 0·8663, for instance, the capacitor would be of the same rating as the welder and the full-load current would remain at the same value.

For an initial power factor of 0·707, the corrected power factor would be unity, and this point is the limit to the range of application of this method of calculation. For initial power factors greater than 0·707, it is simply required to correct to unity power factor.

The curve EF gives the ratio of capacitor kVA to welder kVA for correcting various power factors to unity. This curve intersects curve AB at G, corresponding to an initial power factor of 0·707, and the composite curve AGF gives the appropriate capacitor rating for all hypothetical power factors.

In practice, an arc welder may vary in power factor from 0·3 to 0·4, and would require a capacitor of a rating of 0·535 that of the welder. A resistance welder has, usually, a better power factor of 0·6 to 0·8, and would require a capacitor of a rating 0·6 or 0·7 that of the welder. Bearing in mind, however, that these calculations are but compromises, it is a safe approximation to install a capacitor of 0·6 times the rating of the welder for both arc and resistance types.

It may be opportune to add that the plant should be connected between two 415 volt phases rather than between phase and neutral, not only to reduce the line current, but also to avoid voltage fluctuations in the neutral. Furthermore, it should be noted that the open delta welding transformers designed for connection to three phases have nothing to commend them. The load is inherently a single-phase one, and the effect is to split up the load in the ratio $\frac{1}{2} : \frac{1}{2} : 1$ instead of 1 : 1. There is, therefore, no saving in conductor copper, while the kVA of the transformer is 15% greater. Of over-riding importance is the fact that the power factor correction in this case cannot be dealt with on the foregoing lines, but becomes a complex matter.



NOTES ON WIRING by Megohm

Wiring Accessories

A NEW connection box for t.r.s. cables has been developed by an installation engineer attached to the South Eastern Electricity Board. This comprises a moulded tough rubber box with a recessed fitted cover, fixed by four brass corner screws. The dimensions are 4½ in. × 4½ in. × 1½ in. deep and the box contains two main brass terminals for the phase and neutral conductors and five brass terminals for switch line connections. These terminals are held in position by moulded receptacles within the box and may be released by normal pressure on the moulds. The box can accommodate up to three cables entering from each of the four sides of the box.

Cable Entry

The feature and novelty of this box is the provision made for the entry and exit of t.r. and p.v.c. sheathed cables which are brought in through the back of the box at an angle of approximately 45°. The under-side of the box is fitted with moulded recesses sloping upwards and almost through the bottom of the box to receive the cables. Access for the cables into the box is made by cutting away the thin retaining wall to take one, two or three cables. As the cables are pulled through the box the rubber walls tightly grip the cable sheath and effect a dust-tight connection. When all cables in the box are connected, it is then fixed to the building structure and when fixed in position some force is required to dislodge any one or more of the cables entering the box.

For Small Houses

It is claimed that the use of one of these boxes on each floor in a house not exceeding 1,000 sq ft floor area enables a saving in installation time to be effected and the amount of cable used is kept to a minimum. Furthermore, on repetition work the wiring may be prefabricated thus again reducing installation costs since the wiring for each floor can be brought on to site already connected to the box, cut to length and dropped into position, leaving only the connection of ceiling and switch outlets, etc., to be carried out *in situ*.

The cost of this connection box, which at the present time is being made in small quantities, is less than 5s. per box, and it is reasonable to assume by mass production and the use of alternative materials the cost of such boxes can be further reduced.

Multiple Socket Units

A manufacturer writes to tell me that my correspondent who reported because of an insufficient number of socket outlet points in his flat he assembled a few sockets on a wood block and connected these by means of a short length of flexible cord to a 15 amp two-pin socket, could have saved himself this trouble by using one of the factory assembled two- or three-gang socket units for flush or surface mounting in brown and ivory plastic finishes which have been available for some time. The three-gang units comprise one 13 amp flat pin fused plug and socket and two 2 amp three-pin plugs and sockets with the addition of a 5 amp fused spur terminal, which can be used for wiring to another point in the room to which may also be connected a two-gang 2 amp three-pin plug and socket unit.

Factory Assembled Switches

Another development is the factory assembled switch units which are now marketed and are especially useful for house wiring. These units are made in one-, two- and three-gang assemblies and are fitted with one- and two-way switches or a combination of both types of switches. These switch units are made in brown and ivory plastic finishes and fit into standard one-gang B.S.1299 sheet metal boxes, thus obviating the stocking of different types and sizes of switch boxes. Further, since the switch assemblies are attached to the plate and the plate is fixed to the switch box by two countersunk screws the problem of adjusting levels and of fixing rings working loose is overcome and the connecting up of the switches is simplified.

These ganged socket and switch assemblies, it should be remembered, are suitable only for connection to a.c. services where the potential does not exceed 250 volts.

Safety on the Railways

Proposals for Automatic Train Control

FOLLOWING the serious railway accident at Harrow in October last year, when 112 lives were lost, the British Transport Commission are preparing at once to consider financial authority for a practical programme of installation of a cab warning system. It may be recalled that there were two systems of warning control in existence prior to nationalisation. One, used by the Great Western Railway, utilised a contact system in association with an electric device which together combined to sound a siren and partially apply the brake if the distant signal was at caution, or to sound a bell in the cab if the signal was clear. The other system, used by the L.M.S. on the Tilbury and Southend Line, did not depend on physical contact. A permanent magnet followed at a short distance by an electromagnet was located between the rails at the distant signal. When the distant signal was at caution the electromagnet was not energised and the permanent magnet reversed inductively the armature of a receiver below the locomotive. This opened a small valve to reduce vacuum in a pilot reservoir, which in turn sounded a siren and gave a cancellable brake application, as in the G.W. system. With the distant at clear, the siren begins to sound at the permanent magnet, but is quickly cancelled by the energised electromagnet before brake application takes effect.

In August 1948, the Railway Executive decided to proceed with trials of a compromise equipment which would embody the best features of each, but due to differences in vacuum brake arrangements between Regions and electrical difficulties where trains run over suburban electrification systems, a final prototype was not completed until March 1953.

This design again consists of a permanent magnet followed by an electro-magnet and is situated approximately 200 yards on the approach side of each semaphore distant and multi-aspect colour light signal. Semaphore stop signals are not equipped. A bell is sounded in the cab for 2-4 seconds when a semaphore distant is clear or a multi-aspect signal is showing green. When a semaphore distant is at caution or a multi-aspect colour light is at double-yellow, yellow or red, the siren sounds and a brake application commences. The siren and the brake can be cancelled by the driver to show he is alert, but an attempt to forestall the warning by premature operation of the cancelling handle can only result in a brake application. When the cancelling handle has been used a visual indication appears in front of the driver and remains until reset to normal as the engine passes the next set of track gear.

Trials with the object of giving experience in day-to-day working began in April of this year with 54 engines and the Executive feel that it will be necessary for them to be in full and normal service for at least six months and that a final decision on the design for large scale production cannot be undertaken until the results of the trials are assessed.

The Executive propose two plans, one estimated to cost £7·5 million to cover 1,332 miles of route "or such part of it as may be deemed advisable" covering the lines Euston-Glasgow, Kings Cross-Edinburgh, Edinburgh-Glasgow, Euston to Birmingham, Manchester and Liverpool, Liverpool St. to Norwich and Waterloo to Exeter, Southampton and Bournemouth. The second plan, providing for additional routes, would bring the estimated total costs up to £17·3 million.

Motors Under Arduous Conditions

MOTORS powering slag crushing plant at the Stanton Ironworks Co.'s premises near Nottingham are required to run at full load for most of their 16-hour day, in an atmosphere containing a high content of slag dust. After a short time a considerable deposit of this powder settles out on to each motor, as shown in the illustration, but due to its internal cooling arrangements, state the Brush Electrical Engineering Co., manufacturers of these 65 h.p. Size TRF. 544 motors, temperature rise remains well within design limits.

INSTRUMENTS —*on show*

British Instrument Makers show their wares to the world at the Second Post War Exhibition held at Olympia

PROBABLY no single industry has contributed so much to modern technological development as the instrument industry. Practically every form of process is watched, protected and controlled by mechanism developed by the instruments maker. For this reason, the annual exhibition of equipment produced by the British Instrument Industries is of great interest, not only to the electrical engineer but to the industrialist, the chemist, the physicist, and to all those concerned with continuous processes in any form. This, the second biennial exhibition, has fully established the value of presenting the products of the industry to the world, and, to judge by the number of exhibitors, is regarded by the industry as a most important function.

Electrical Measurement

In these days, practically every one of the physical and most of the chemical, measurements can be converted by means of intermediary devices into a proportional electrical quantity. Because of this, most indicating instruments are therefore electrically operated. However, many instruments are designed specifically for the measuring of electrical qualities. Among these are, of course, the multi-range general purpose testing sets, so well known in the industry. In this field, the primary purpose is to provide a robust, accurate equipment and to extend the range of uses to which it can be put. For example, the well-known "Avometer" can now be used to measure power, power factor and kVAr by means of a new accessory, the "Avo" power factor and wattage unit. Measurements can be taken, using this new device on single, two-phase, balanced or unbalanced a.c. supplies. Multi-range test sets, with sensitivities of 1,000 ohms/V and 20,000 ohm/V with 2½ and 5 in. scale sizes are also produced by British Physical Laboratories.

For the industrial engineer the "Vampire" test set, by Everett Edgcumbe, which gives p.f. current and wattage readings up to 5 kW is most useful. Other multi-range general purpose instruments are being shown by Electrical Instrument Co., Electronic Instruments Ltd., and Taylor Electrical Instruments.

Coming now to the single purpose type of instrument, attention is being increasingly paid to clarity of reading and general styling. These instruments are, of course, designed mainly for permanent or semi-permanent mounting, and are generally confined to the reading of amps., volts, watts, p.f., frequency, VA and VArs.

Compared above are Ferranti's electronic computor equipment and the d.c. valve voltmeter by Baldwin Instruments

English Electric are showing square and round cased instruments side by side in both flush and surface-mounted patterns, while G.E.C. also have an interesting range of switchboard and portable instruments including, in the latter category, a new a.c. circuit analyser for measuring volts, amps, power and p.f. simultaneously. Mention should also be made of the Crompton-Parkinson range with the long open circular scales which are so easy to read. Apart from the standard instruments C.P. are exhibiting the Admiralty Pattern switchboard instruments designed to stand up to severe shock. Many of the features developed for these units have been incorporated in the normal range.

Part of the range of moving coil and moving iron ammeters and voltmeters from 20 in. to 8 in. dia. made by the Electrical Instrument Co., can be seen, while Metropolitan-Vickers have a kVA meter which provides for the measurement of 3-phase kVAh and kVA demand. Elliott Bros. also show part of their well-known range. Nalder Bros. and Thompson, Ltd., have a good display showing round or square pattern units, while comprehensive ranges of instruments are available from Record Electrical Co. (Cirscale), and Measuring Instruments (Pullin) Ltd.

Chart Recorders

A vital complement to the direct reading instrument is of course the chart recorder. Many firms are showing this type of instrument in several variations. Bristol Instrument Co. have a complete range for the measurement of pressure, vacuum, temperature and flow, while British Rototherm concentrate more on temperature recorders operated by mercury in steel thermometers. Cambridge Instruments, out of their extensive range, have an interesting recorder using a Teledeltos type paper for electrocardiography work. In this case the paper is curved in a transverse plane to permit the pen to be mounted at an angle above it.

Temperature recording again is exhibited by Coley Thermometers and the recording of flow by Electroflo Meters. The Record Electrical Co., Ltd., have a new range of graphic recording instruments of extremely compact design which can be supplied either flush, projecting, rack mounted or portable according to customers' requirements. Of considerable interest is the Evershed and Vignoles stand where a large graphic panel depicts the operation of a large continuous process plant. In this exhibit, miniature edgewise indicators and miniature chart recorders, operated by Evershed electronic repeater transmitters are included in the diagram at appropriate points, and knobs for setting the proportional, integral and derivative actions of the Evershed 3-term controller are also included in the actual diagram although the controllers themselves are grouped together in a "nested" control cubicle which can be located in a separate room. Sunvic Controls, Ltd., also have an interesting instrument which is a high-speed potentiometric electric recorder, capable of recording 16 points simultaneously on one instrument. Graphic instruments are also well featured by numerous other firms.

Relays

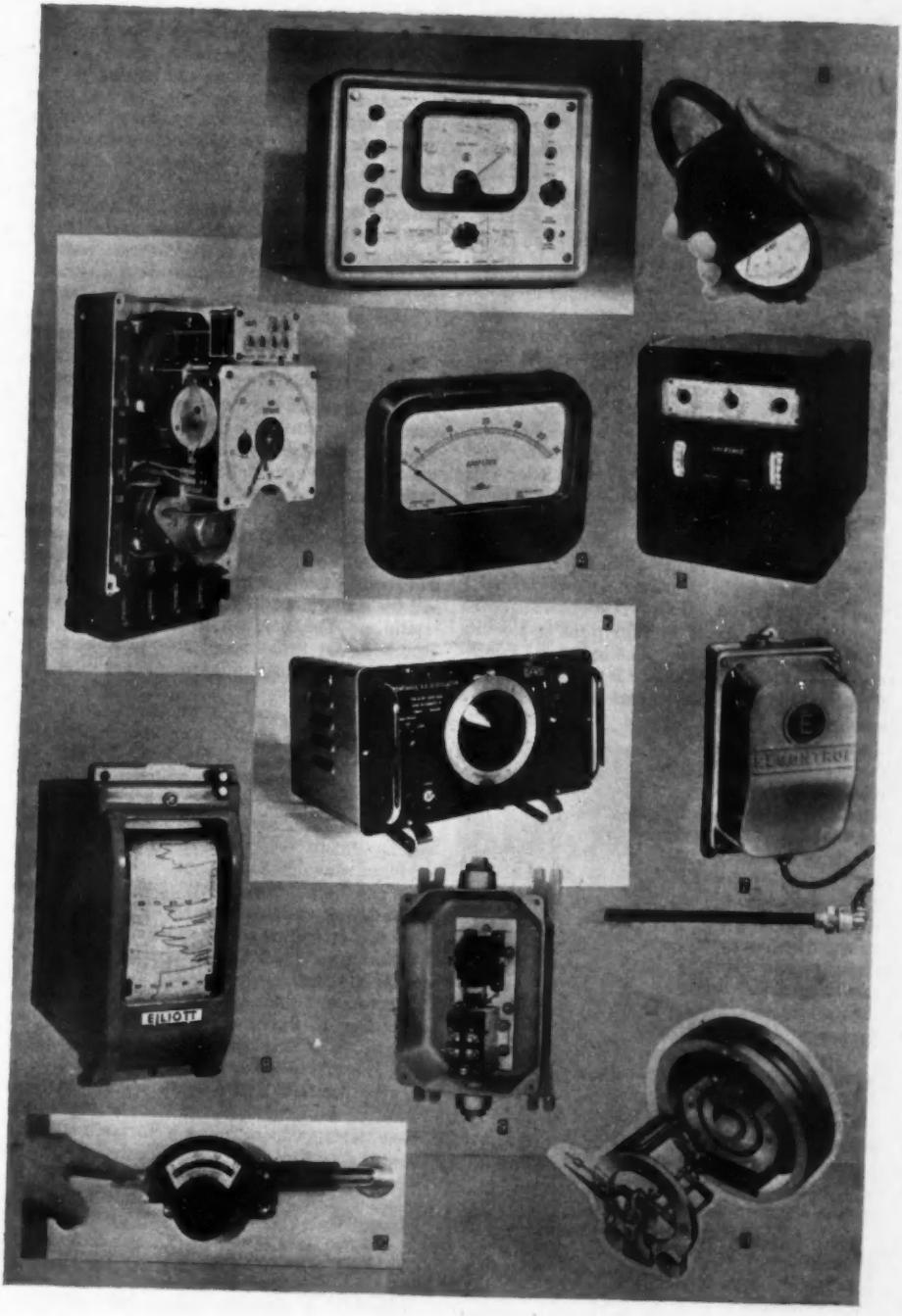
Relays, in their almost infinite variety, are to be seen on many stands. Electro Methods, Ltd., have, for example, a wide selection of relays for all purposes, including aerial switching, miniature polarised types, mercury in glass (for temperature control) and miniature general purpose. Protective relays, both triple pole and single pole units, as well as the Buchholz type for transformer protection are being shown by English Electric, while the earth leakage protection type FM is exhibited by Ferranti. High-speed moving coil relays of the latest type are being shown by Metropolitan-Vickers Electrical Co., and a wide range of units with instantaneous, inverse and definite time characteristics, with single or multi-way contacts are available from Nalder Bros. and Thompson.

Power Station Plant

Most impressive in the power station category is the complete boiler instrument and automatic control panel displayed on the George Kent stand. This is one of 12 being supplied to the new Uskmouth station.

Bailey Meters and Controls have the latest arrangement of a console desk incorporating miniature instruments for controlling a "unit" power plant comprising boiler and turbo-alternator with auxiliaries such as pulverisers, fans, feed heaters, c.w. pumps and so on. The same firm are also showing the "Levelscope," a recent development in the use of industrial television for the transmission of boiler gauge

(1) Myria Megohmeter. (2) G.E.C. link ammeter. (3) English Electric m.d. meter. (4) Measuring Instruments (Pullin) Series 35 5½ in. scale moving iron meter. (5) Evershed electronic 3-term controller, Mk 3. (6) Dawe portable A.F. oscillator. (7) Elcontrol proximity switch with electrode. (8) Elliott Bros. Type 230 recorder. (9) Electro Methods pneumatic time delay relay operating over range of ¼ to 180 secs. (10) Metrovick Filtometer. (11) Mechanism of Crompton Parkinson circular scale moving iron instrument

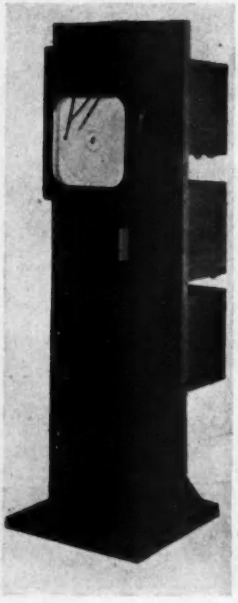

ELLIOTT

glass reading with receivers in the control room or on the firing floor.

Test equipment for the power industry is represented by the English Electric portable electronic insulation testing set, capable of providing up to 10 kV d.c. and giving a measurement of insulation up to 250,000 megohms. Giant remote indicators can be provided by Everett Edgcumbe, and Record Instrument Co., among other firms. Metropolitan-Vickers' power station load summation equipment gives an indication of the total load on the station on a 36-in. dia dial with 54 in. long scales covering an angular swing of some 300°.

Electronic Equipment

As we have had occasion to mention before, the tendency to use electronic equipment to perform, or to act as an intermediary in measurement and control shows no sign of abating, and this exhibition serves well to emphasise this trend. Airmec Ltd. have a most comprehensive display of electronic laboratory test gear; Cass and Phillip have a multi-circuit electronic test set, Cintel are showing a number of special units including chronometers and special pulse generators; Cossor's double beam oscillographs with their accessories are well to the fore, while a variety of laboratory and industrial equipment is to be seen on Dawe Instruments stand. Electronic Instruments, apart from their valve voltmeter, have several items in the electro-chemical field related principally to pH measurement. Marconi Instruments have their well-known range of equipment, covering particularly the communication field, on show. Important new additions to the range of Mullard valves and special tubes are now available and the equipment division of the same firm are exhibiting, in addition to electro-chemical apparatus and electronic instruments, several items using ultrasonic power, including a reciprocating bench drill, a high power reciprocating boring and cutting machine, ultrasonic soldering iron and a large tinning bath. The Minirack system of building up single and multi-channel cathode-ray recording equipment is demonstrated by Southern Instruments, Ltd., and special cathode ray tubes are featured by 20th Century Electronics, Ltd. Electronic counters and scalers are also being shown by Sunvic Controls.



This Bristol-B.T.H. telemetering unit can deal with 30 channels

Special Equipment

Items of particular interest can always be found in the special equipment field, and several firms, whose products cover a particularly wide range have concentrated on a few items representative of their general products and included some special items. Ferranti, for example, show the control desk, the high speed tape-reader and a section of their electronic computor, together with a model of the complete machine. A further special item on their stand is the polyphase testing set for three-and four-wire meters, which will fill, it is thought, all the requirements of large and small testing stations. The Baldwin Instrument Co., who specialise in radiological thickness measurement had Beta, "X" and Gamma ray thickness gauges, as well as the "Statigun" static charge detector, which gives a measurement of the charge in kV/ft. On the Metropolitan-Vickers stand can be seen the EM4 50 kV electron microscope designed particularly as an inexpensive instrument for routine work in laboratory or factory. It has a magnification of up to 12,000.

High vacuum equipment including pumps and gauges are shown by W. Edwards and Co., and it is interesting to note that Sunvic Controls are also exhibiting equipment in the same field.

Nucleonic physics is, of course, represented by several instruments mostly in the form of detectors and their associated electronic counters. One of these, shown by the Ministry of Supply, is a Gamma ray detector for aerial survey work to locate uranium ore deposits.

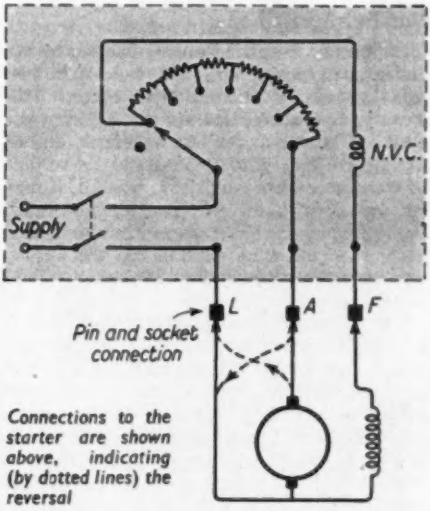
The Electrical Research Association are also showing some special instruments which they have developed, including a portable a.c. discharge detector which measures the energy dissipation in individual voids in insulation. The test set shown is suitable for testing solidly-earthed equipment installed on systems up to 33 kV r.m.s. Another instrument provides an improved method of testing the moistness of paper insulation.

PROBLEMS AND PRACTICE in Engineering

Reversed Starter Connections

THE article submitted by "J.A.W." under the heading of "Motor Breakdowns" in the ELECTRICAL TIMES dated June 11, has an association with an experience the writer had some years ago. The shunt wound motor geared to a stamping machine was of the portable type. The leads from the motor were soldered to brass pins and lettered L.A.F., representing line, armature, field. The three leads were adapted to fit into sockets also lettered L.A.F. The sockets were wired to a d.p. switch and a hand operated starter, some distance away.

On one occasion on starting up in the usual manner, the armature raced, and also rotated in the opposite direction. Further, the no-volt coil of the starter failed to energise. The armature racing suggested a weak field, but the reversal was another problem. The motorman



Connections to the starter are shown above, indicating (by dotted lines) the reversal

(a very reliable person) reassured me that the leads were plugged in to the "letter."

The brass pinned leads were withdrawn from the socket, a lamp test was applied across L.A. and L.F. with switch and starter closed. The lamp lit in each case, signifying all correct.

Lifting the motor brushes, a "Megger" insulation test was applied across the brass pinned leads lettered L.F. There was no deflection of the needle, thus indicating an open field. A further test was applied across the field itself, and surprisingly the needle deflected.

With the reversal of the armature still at the back of my mind, I decided it would be best to trace out the leads to the motor. The black tape was removed, but in the act of tracing out the leads word came that, during the removal of the portable machine (on the previous shift), the line and armature brass pins had become severed. On tracing out the line and armature leads the fault became apparent. The L and A brass pins had been resoldered in reverse.

It will be observed in the diagram, that the wrong connection (shown dotted) causes a current reversal in the armature as indicated by the arrows. Moreover, the field and n.v. coil circuit becomes a closed loop, thus stopping the field current.—*Novis.*

Motor Breakdowns

UNDER the above heading in the issue dated July 2 both your correspondents "E.A.R." and "J.A.W." refer to the kick neutral method of determining the neutral brush position of a d.c. motor or generator, and contrast it with the circumstances described by "J.A.W." in your issue dated June 11. I would like to point out that in the former the armature is entirely disconnected from the field windings, while in the latter the field windings and armature were connected in series. In the kick neutral test the armature windings do not form a part of a highly inductive circuit, whereas in the conditions described by "J.A.W." the high induced e.m.f. set up in the field coils was distributed partly across the armature windings.

It was interesting to note that the insulation faults were between armature conductors and the core, not between turns. This seems to indicate that one side of the supply was at earth potential and the frame of the motor earthed. The slot insulation was apparently weaker than that between the field winding conductors and the pole magnets.—*R.A.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered.

Detection of Incipient Insulation Failure

PREMATURE failure of insulation is often related to the occurrence of discharges in internal voids, and the detection of such discharges by aural or visual means has long been known. Detection by means of electronic amplifiers responding to the transients which these discharges generate has also been in use for some time, but little attention was paid to the design of the amplifier itself with the result that performance with this type of detector has fallen short of optimum.

Another method used is that of employing h.t. direct current, and a number of discharge detectors using this are on the market. The advantages of this system are that the test voltage can be rejected by a simple blocking capacitor, and the h.t. can be provided by a light-current, non-lethal generator. Where high grade insulation is under test, however, the discharge repetition rate is low and indeterminate and the results tend to be ambiguous, while the instrument itself is inclined to be insensitive.

Work has therefore been carried out at the E.R.A. (Report V/T115—Design and Performance of a Portable a.c. Discharge Detector by G. Mole) to design an amplifier with good sensitivity and yet one that could be used for making tests in the field on the major insulation of electrical power systems such as switchgear and transformer bushings, busbars, generator insulation, cables, etc. The amplifier however was to be applicable to d.c. as well as a.c. systems.

Requirements

Fundamentally, the amplifier requires to have a response falling into the range 50 c/s to 10 Mc/s. Means must be taken for rejecting the applied h.v. a.c. waveform, and the output should be displayed in a manner which will show the discharges superposed upon the test wave form. The input circuit should be safe in use, and the instrument should be portable and able to be used with long test leads and, if necessary, long leads to the display unit.

The Report details the circuit arrangement adopted to achieve these requirements. In its final design, the test arrangement consists of three main units. The input circuit has to give rejection of the test voltage. This circuit is connected to the amplifier unit by a 20 ft. length of lead. The amplifier proper, with its output filter, calibrator and power pack, is built into a single instrument case 16 in by 9 in by 8 in with a total weight of 34 lb. Finally there is the display unit, which is at present separate and consists of a cathode ray tube on which the amplifier output is displayed on an elliptical trace derived from the same source as the test voltage.

In order to gain maximum sensitivity the input circuit must be in tune and matched to the specimen under test. For this purpose fourteen interchangeable input units are provided, each covering a 2:1 range of capacitance. By this means insulation or capacitance between 15 pF and 0·25 μF may be tested at full sensitivity.

Calibration

Calibration is carried out by comparing the discharge response with that from a known d.c. step injected into the input circuit. This d.c. step is synchronised via a relay from the same a.c. source as the test waveform, and as its magnitude is equal to the steady d.c. voltage of the source from which it is derived, it may be measured with an ordinary voltmeter. The calibration voltage appears as a vertical marker on the elliptical trace on the display unit cathode ray tube and can thus be compared directly with the discharges.

Experience with the unit shows that 100 kc/s as the response frequency of the amplifier seems satisfactory in most respects, although in some localities trouble was noticed with morse transmissions breaking through when large unscreened specimens were under test. It may therefore be necessary in these cases to find a waveband 10 kc/s wide between 10 kc/s and 150 kc/s which might be more free from radiation than the 95-105 kc/s band used in the instrument. It was not thought possible to increase the sensitivity of the instrument much further in its field-use form.

The Report is available from the E.R.A., Thorncroft Manor, Dorking Road, Leatherhead. Price 15s.

Flexible Armoured Cables

"Corrusteel" technique now becoming applicable to larger and special services cable requirements

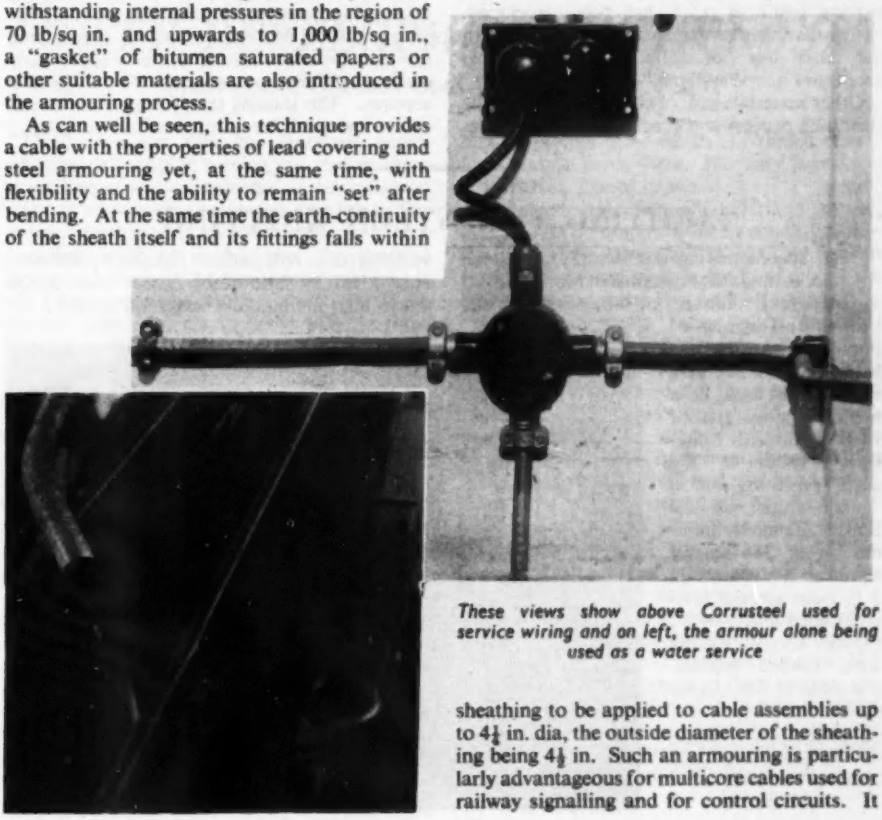
IT is now over three years since the Wandleside Cable Works, Ltd. first introduced their "Corrusteel" for armoured cables, and during the interim period continuous research has been carried out in order to improve the manufacturing techniques involved, and to extend the range of application. In service, the cable has proved most satisfactory and as a result it is in great demand.

The principal feature of this type of armoured cable lies in the construction of the outer sheath, which normally consists of corrugated lead-coated steel tapes lapped helically around the cores by a special machine. In order to make the sheath watertight and capable of withstanding internal pressures in the region of 70 lb/sq in. and upwards to 1,000 lb/sq in., a "gasket" of bitumen saturated papers or other suitable materials are also introduced in the armouring process.

As can well be seen, this technique provides a cable with the properties of lead covering and steel armouring yet, at the same time, with flexibility and the ability to remain "set" after bending. At the same time the earth-continuity of the sheath itself and its fittings falls within the I.E.E. regulation limits of one ohm resistance, despite the fact that the resistance of the armour itself is somewhat higher than that of conduit.

Uses and Applications

The original "Hitest" Corrusteel range was produced in five types. Types I and II for normal indoor use, factory wiring, rising mains, etc., Type IV for use in damp or exposed positions, and types III and V for burying direct in the ground such as is common in street lighting cables. Special types can, however, be made to order, and recent developments permit the sheathing to be applied to cable assemblies up to 4¼ in. dia, the outside diameter of the sheathing being 4½ in. Such an armouring is particularly advantageous for multicore cables used for railway signalling and for control circuits. It



These views show above Corrusteel used for service wiring and on left, the armour alone being used as a water service

should be noted that for normal service use, joints can be plumbed direct on to the sheath, nor does the cable require any special type of accessory; the usual boxes, tees and switchgear entries being suitable.

Another interesting feature of these cables is that deformation does not alter the insulation clearances between cores, and they can thus be produced if necessary in sections other than circular. In fact, "flattened" cables have been made to special order of the Ministry of Supply.

Further advantages consequent on the use of this sheathing technique apply to the use of the cables in hot conditions. First, due to the corrugation of radiation area per unit length is greatly increased, and second, the corrugations can "take up" the difference in the expansions of copper and steel. Thus the conductors remain in their correct relative spacing without any tendency to kink. Naturally, where cables are to be used in temperatures of 100 to 150° C, special insulation must be used, and for this purpose "Wandlyne," a high temperature stoving grade of p.v.c. has been developed. Alternatively, glass tapes can be used, although the latter has not quite as good electrical properties as "Wandlyne."

Other materials can, of course, be used in the sheathing process and specially screened cables have been made, using copper and other materials.

Future Developments

At present, the processes of laying up the cores and armouring are being carried out on two different machines. Steps have, however, been taken to integrate the processes as one single cable-making operation, and it is expected that a new machine will be ready for operation soon.

When this occurs a substantial increase in production should become possible with a consequent price reduction. Further developments of the technique involve the possibility of manufacturing h.v. cables of the pre-impregnated pressure type, and of making large flexible trailing cables for mining applications. Preliminary investigation into these possibilities are most encouraging.

It is interesting to note that in a new extrusion plant being built at Wandleside for the manufacture of special cables, the armouring process has been used throughout, not only for main electrical services (laid direct in concrete) but also for motor leads, thermo-couple leads (under high temperature) and for all lighting services. The sheaths themselves, without the cores, are used for water and air supplies.

LIGHTING FOR NYLON KNITTING

THE accompanying photograph shows the cold cathode lighting installation planned by Metrovick illuminating engineers for the Leicester factory of Pool Lorrimer and Tabberer Ltd. Three-tube battens are used at a mounting height of 18 ft 8 in. with "daylight" tubes in the outer positions and a "warm-white" in the centre. A general illumination of 34 lumens/sq ft at a distance of 3 ft from ground level is attained and over 12 months only four tubes have needed replacement out of 240. In the warping room cold cathode lighting is also used, augmented by fluorescent hot cathode lamps where high illumination levels are needed.

Good visibility is shown by the picture of these knitting machines at a nylon factory

POWER DEVELOPMENT IN HUNGARY

New Inota Station uses Czechoslovak Plant

THE Five-year Plan for Hungary, which aims primarily at turning the country from a predominantly agricultural to an industrial one, is apparently going to schedule. The power requirements of this plan are being supplied both by hydro and by thermal generating stations. In the former category is the Tiszalök barrage on the Tisza River, which has an installed capacity of 54 MW in three Kaplan turbines. Thermal stations include Kazincbarcika in Borsód county, in the north-east Mátra, in the Mátra mountains, Mohács in southern Hungary and a large plant (200 MW) attached to the new Stalin Iron and Steel Works, 40 miles south of Budapest.

Inota Station

One of the stations to be completed this year is the Inota station in western Hungary, a photograph of which is shown above, which was begun in April 1950 and will contain six generators. The first unit went into operation in 1951. The station is located in the Hidegvölgy valley and is called "Seventh November." It will supply surrounding industrial concerns, including an important aluminium plant, with power. Fuel is low calorific lignite, which is brought directly into the power station by a cable conveyor from the Várpalota coal mine which is situated only a few hundred yards away. Hungary is particularly rich in lignite deposits.

Although the station is Hungarian designed, much of the equipment came from Czechoslovakia, and a large number of Czechoslovak workers were employed in the assembly of the generators and other electrical equipment.

Full advantage is being taken of other potential power sources in the country. At Lovázi supplies of natural gas are available which it is intended to use for a new thermal station. In Transdanubia and northern Hungary, where the area is mountainous, a large number of sites have been prospected for the construction of small hydro-electric plants, and it is believed that work is already in progress on some of these sites. The smaller plants will be used for village and rural electrification and will also take some of the pressure of the larger stations.

The Five-year Plan aims at raising steel production from 800,000 tons to 2·2 million tons, and coal from 11 million tons to 27·5 million tons. Engineering development includes the manufacture of transport vehicles, machine tools, earth moving plant and the extensive use of pre-stressed reinforced concrete sections for house and factory construction.

overseas news

Saskatchewan Power Grid?

The question of an integrated power pool to serve most of Saskatchewan as a solution to the rapidly increasing power demand in the province, was discussed recently at a two-day conference of officials of the Saskatchewan Power Corporation and representatives of the various cities. According to Mr. W. B. Clipsham, chief engineer of the Corporation, the latter's proposal calls for 132 kV lines to stretch from Estevan through Weyburn to Regina, west to Moose Jaw and northwest to the South Saskatchewan River project location. From there the line would go north to Saskatoon, then on to the proposed Fort a la Corne hydro-electric site. There would also be a number of 69 kV lines linking other centres. From the report of the conference, we judge that while many of the cities' representatives expressed guarded support for the integration proposal, they also emphasised their need to retain power revenues for the cities' own purposes. This view is not endorsed by the Power Commission who take exception to the cities using power revenues for other municipal needs although they are prepared to concede the cities what they term "reasonable" revenues from the sale of electricity.

Developing the St. Maurice River

The Shawinigan Water and Power Co. has now received the official consent of the Quebec Government to its proposal to increase the output of three hydro-electric plants by 149,500 h.p. At the Rapid Blane plant the existing 200,000 h.p. station is to be expanded by 40,000 h.p., a further 65,000 h.p. of plant is to be installed at the Rapide a la Trenche station and an additional 22,500 h.p. is to be obtained from the La Tuque development. All these stations are on the St. Maurice River.

Brazil's Fuel Plan

After a great deal of discussion, and some amendment, Brazil's national coal plan has now become law. This plan envisages a five-year development programme which will cost Cr$955 million, it is now estimated. Apart from almost doubling the output of coal, and the construction of additional railway links, it is proposed to erect a steam power station in the coalfields of Parana and another in the coalfields of Santa Catarina. It is planned that both these stations will utilise types of coal unsuitable for export and uneconomical for other purposes.

Nicaragua's Plan

The Government of Nicaragua has recently formed a Ministry for Economy which is charged with the duty of acting as the co-ordinating authority for carrying out the recommendations of the country's Five-Year programme which was put into operation last year. Part of this plan provides for expansion of the present power supply capacity of Nicaragua to three times its present size, together with a transmission network to connect with other important cities.

New Schemes for Luxemburg

Two new hydro-electric projects are to be started in Luxemburg in the near future, financed out of Marshall Aid counterpart funds and budget allocations. Both will be on the River Sure —one near Esch and the other near Rosport, Echternach, on the German frontier. Work on the former scheme is to start next year. Its output is estimated at 16½ million units annually, and the cost at 200 million francs. For the Rosport power station work should begin early in 1955. This station will generate 22·6 million units annually, and will cost 140 million francs.

Tignes Dam Inaugurated

The new dam at Tignes, in Savoy, was formally inaugurated by the President of the French Republic, M. V. Auriol, last Friday. The dam, the highest in Europe, is nearly 600 ft high, and has taken six years to construct. The lake impounded, when completed, will have a capacity of 300 million cu yd, providing a potential power output of 700 million units annually. The president later visited the power station at Malgovert, 2,500 ft below the dam. The village of Tignes, it may be remembered, was the scene of angry protests by some villagers early last year, when they had to be evacuated, because the village had to be submerged in the new lake created. The Malgovert power station is the first of the series of developments below Tignes and Les Breviers which will utilise the regulated flow of the Isere provided by the Tignes dam.

Expansion in Cape Province

Development on a comparatively large scale of the electricity undertaking of the Somerset East (Cape Province) Municipality is to take place. A loan of £165,000 has been decided on by the Council and approved by the ratepayers, with which to install a 1,250 kW turbo-alternator and two 12,000 lb/hr boilers, with economisers. This expansion has become necessary to meet the demand which has doubled in the last three years. The undertaking only started up in 1939 with two 150 kW Belliss and Morcom sets and Babcock and Wilcox boilers, and in 1950 two more 400 kW sets with another B & W boiler were installed.

The generating voltage is 33 kV, and power is distributed at 3·3 kV and 11 kV by underground and o.h. lines to the town itself and by means of an 11 kV o.h. line to the railway junction of Cookhouse, 16 miles away. The engineer in charge of the undertaking is Mr. W. H. Atteridge, B.SC.(ENG), A.M.I.E.E.

Volta Scheme Participation

The determination of the Gold Coast to participate to a greater extent in the exploratory stages of the Volta River project was emphasised by Dr. Nkrumah, the Gold Coast Prime Minister, when opening the new session of the Assembly last Thursday. He said the Government proposed to establish a National Committee for the project, consisting of the Minister of Finance, the Minister of Commerce and Industry, and three other nominees. The Government intended to call in men of international repute in fields of hydro-electricity, economics and finance as advisers. Acceptance had already been received from Dr. Arthur Morgan, who was the first chairman of the Tennessee Valley Authority. It was also proposed to obtain technical assistance, where available, from the International Bank for Reconstruction and Development and the Mutual Security Administration.

Electrification in the Punjab

The Punjab Government has made provision for an expenditure of approximately two million rupees for new works covering extensions of electric lines, mostly to rural areas, and for supply of power to the irrigation branch in certain areas. This provision covers electrification of about 20 villages, for which the work is in hand. Construction of the Nangal power house No. 1 is in a fairly advanced stage, and installation of the two 24 MW generating sets is expected to be completed by next June. At the Kotla No. 2 power house, two similar sets are planned to be in operation by June 1955. On the transmission side construction work is in progress on 200 miles of 22 kV lines, 203 miles of 123 kV lines and 155 miles of 33 kV lines. These power lines and their associated 44 grid substations are expected to be completed by the end of next year.

Plant Manufacture

We now have more definite news that the Government of India proposes to build a factory for the manufacture of heavy electrical equipment. Mr. A. K. Chanda, Secretary of the Ministry of Production, recently came to London to seek financial and technical assistance for the project. He is also visiting Switzerland, Germany and Austria. This new project is expected to cost between Rs. 300 and 400 million. A site has not yet been fixed but it is hoped that production will start in 1955. During his trip Mr. Chanda is endeavouring to advance the delivery dates of machinery for the Government-controlled cable factory at Rupa Narayanpur, near Chittaranjan.

Local Production

The trend towards indigenous manufacture in India of various electrical equipment is further exemplified by a report that a firm in Calcutta has almost completed plans to make switchgear locally. The firm has received a licence to import plant, machinery and components, we gather, and the factory is expected to go into production later this year. The government of Mysore also proposes to manufacture h.t. insulators with the technical collaboration of a Japanese firm. Negotiations are complete, we understand.

Tasmania's New Station

The Tungatinah power station of the Hydro-Electric Commission of Tasmania is going into operation this month when the first of five 35,000 h.p. turbines goes on load. A second machine will probably be operating within a month. For this station the turbines have been supplied by Boving and Co. Ltd. and the alternators by the General Electric Co. The sets are to operate under a 1,000 ft effective head. In this power development more water is carried from the central plateau of Tasmania to the Tungatinah power station on the Nive River almost opposite to the existing Tarraleah station. The development, on which work started in 1948, has involved the construction of seven dams; 35,700 ft of flumes, canals and open cuts, and 13,198 ft of tunnels. After the waters have been used at Tungatinah it is proposed to pass them on to Wyatinah power station where three English Electric 56,000 h.p. turbines and alternators will be installed, and later to use the water again under a tentative plan for a further station on the Derwent near Ouse.

Advisory Council for Snowy

A seven-member Advisory Council on the Snowy Mountains hydro-electric scheme has been announced by Australia's Acting Minister for National Development. The members are: chairman, Dr. H. G. Raggatt, secretary of the Dept. of National Development; vice-chairman, Dr. L. F. Loder, director-general of works; Mr. W. Hudson, Commissioner, Snowy Mountains Hydro-Electric Authority; Mr. H. Conde, chairman of Electricity Supply Commission of N.S.W.; Mr. R. A. Young, Commissioner, Water Conservation and Irrigation Commission, N.S.W.; Mr. W. H. Connolly, assistant general manager, State Electricity Commission of Victoria; and Mr. L. R. East, chairman, State Rivers and Water Supply Commission, Victoria. The Advisory Council's main duties are to advise and report on (a) the nature, sequence and rate of construction of the hydro scheme works; (b) matters affecting N.S.W. and Victoria concerning diversion of water; (c) the generation, transmission and allocation of power; (d) the co-ordination of the various works; and (e) the basis for allocating the cost of the scheme and the charges for electricity made available. The latter problem has already been discussed by representatives of the States concerned, and it seems that difficulties have arisen.

PERSONALITIES

IN THE INDUSTRY

Mr. James Nelson, F.S.A.(scot.), F.R.P.S., M.I.E.E., Hon.M.Brit.I.R.E., relinquished on June 30 his post with British Insulated Callender's Cables Ltd., which he took up in 1945, after spending some 17 years with the Central England area of the Central Electricity Board as transmission engineer. Earlier he had gained experience in the Bristol area. Mr. Nelson, who is a keen photographer, hopes that his future activities will enable him to see his old friends from time to time.

Mr. James Nelson

With the expansion of work and scope of the electrical engineering section of the Mechanical and Electrical Engineering Department of the Wigan and District Mining and Technical College, the governors have decided to form separate departments for both the mechanical and electrical engineering sides. Appointed to the post of Head of the Electrical Engineering Department is 32 years old **Mr. E. T. Blakeman,** B.Sc.(Eng.), A.M.I.E.E., who, after spending a period of 10 years with the English Electric Co., Ltd., joined the staff of the College in 1948. Since 1950 he has been senior lecturer in electrical engineering there. He was educated at King Edward VI Grammar School, Stafford, and joined English Electric as a student apprentice while studying at Stafford County Technical College. Later he was a draughtsman in the firm's electrical machine section before transferring to the Preston Works as project draughtsman on the development of new aircraft.

Presentations were made last week by **Ald. W. Lewis,** chairman of the Midlands Electricity Board, to two members of the Board's Birmingham staff, who have retired after many years in the electricity supply industry. **Mr. A. Simpson,** transmission engineer of the Birmingham and district sub-area was presented with a television set from the sub-area staff, and **Mr. Sidney Shaw,** senior assistant engineer (contracting), received a gold watch and a tea service.

The Metropolitan-Vickers Electrical Co. Ltd. announces that **Dr. Willis Jackson,** D.Sc., F.Phil., M.I.E.E., took up duties at the beginning of this month as director of research and education, and has also joined the Board of the company—positions his acceptance of which we noted in our January 22 issue. Dr. Jackson's appointment releases **Dr. C. Dannatt,** O.B.E., M.C., D.Sc., M.I.E.E., A.Amer.I.E.E., for an extension of his present duties as assistant managing director—the post he has held since 1951.

Promoted as successor to **Mr. F. Daft,** who has retired from the position of chief clerk in the Nuneaton district of the East Midlands Electricity Board after 40 years' service, is **Mr. T. Snow,** who was formerly an accountancy assistant in the consumers' accounts section at Nuneaton.

Next month **Mr. K. W. Wardrop,** B.Sc.(Eng.), A.C.G.I., takes up his new duties as lecturer in electrical power engineering at the City and Guilds (Engineering) College, under Mr. W. Humphrey Davies. There, he will be primarily concerned with the network analyser, a matter with which he is thoroughly familiar having been associated with the design of such apparatus for some years past. It has been, in fact, his principal task since August 1950, when he joined the B.E.A. at headquarters as third assistant engineer, after spending two years as assistant engineer in charge at the A.E.I. Network Analyser Department at Willesden. He is no stranger at the City and Guilds College for he took his degree course there in 1943-1945 and afterwards became a graduate apprentice with B.T.H. at Rugby.

Mr. F. J. Thompson has been appointed commercial manager to the Express Lift Co. Ltd., to succeed the late **Mr. A. E. Hunt.** During 29 years service with the Company, Mr. Thompson has served in the Export, Sales, Accounts and Costing Departments, as well as in the Personnel, Welfare, Training and Educational Departments.

Elected as chairman of the Association of Electrical Machinery Trades for the ensuing year is **Mr. G. W. Smith** of Smith & Co., of Carlisle. **Mr. W. E. Lawton,** of the Industrial Electrical Co. Ltd., was re-elected president, with **Mr. C. E. Collins** of Collins Electrical Ltd. as vice-chairman and **Mr. F. H. Washington** of F. J. Wilcock Ltd., Birmingham, as treasurer. Mr. G. W. Smith completed his electrical training under the guidance of his late father, Mr. W. W. Smith. who founded the firm of Smith and Co. 35 years ago. He was made a junior partner in 1940, and since 1949 he has been one of the principal partners of the firm, which specialises in repairing and rewinding of electrical machinery.

Mr. G. W. Smith

Mr. E. D. E. Andrewes, a director of Tube Investments Limited, and until recently managing director of the company's export organisation, TI (Export) Ltd., has been appointed joint managing director of Accles and Pollock Ltd.

Appointed as Professor of Electrical Engineering at the University of Roorkee—the first of India's technical universities—**Mr. K. Aston,** M.SC., M.I.E.E., a Blackpool professor, sailed for India recently to take up that post. Mr. Aston, who is 63, has many years experience of India. From 1938 to 1943, he was Professor and Head of the Department of Electrical Technology at the Indian Institute of Science in Bangalore, and he returned there in 1947, for three years, for a special assignment in connection with the design and equipment of a new high voltage laboratory. Prior to 1935, he was lecturer and electrical engineer at University College, Cardiff, after earlier experience with Metropolitan-Vickers Electrical Co. as a designer engineer.

After 48 years service in the industry **Mr. A. T. Gray,** deputy chief commercial officer of the London Electricity Board, has now retired. To mark the occasion he was the recipient of a presentation made at a ceremony on Monday attended by 80 friends and former colleagues. Mr. Gray started his career with the Kent Electric Power Co. in 1905, and, as local secretary of the concern, took part in 1937 in the organisation of the Kent group of companies associated with the County of London Electric Supply Co. Ltd. He joined the headquarters staff of the County Co. in 1939, where, until nationalisation, he held the position of contracts manager.

The Council of the Institution of Locomotive Engineers have awarded the Institution's Gold Medal (their highest award) to **Mr. R. A. Riddles,** C.B.E., member for Mechanical and Electrical Engineering, the Railway Executive, for outstanding services in the advancement of locomotive engineering.

The Simplex Electric Co. Ltd. announce that **Mr. A. MacDonald,** T.D., M.A., M.I.P.E., A.M.I.E.E., has recently taken up an appointment with the company at their Creda Works, Blythe Bridge, Staffs, and will be in charge of motorised appliances development. Mr. MacDonald took his degree at Cambridge University, and in 1933 joined the engineering staff of Hoover Ltd. After war service in the Royal Corps of Signals he returned to that company in 1945.

Mr. A. MacDonald

Mr. F. H. Harris, B.SC., A.C.G.I., M.I.P.E., and **Mr. E. H. L. Cooper,** M.I.Mech.E. M.I.E.E., M.I.P.E., F.I.I.A., have been appointed joint general managers of Henry Meadows Ltd.

Professor Arnold Tustin, M.SC., M.I.E.E., professor of electrical engineering at Birmingham University, has been invited by the Massachusetts Institute of Technology to accept an appointment to the Webster Chair of Electrical Engineering from October 1 next to May, 1954. Birmingham University has granted him leave of absence for that period. This new appointment is connected with the reorganisation of the Massachusetts Institute of the teaching and experimental work in the field of heavy current electric machines, we gather. Before going to Birmingham University in 1947, Prof. Tustin was chief assistant engineer at the Sheffield works of Metropolitan-Vickers Electrical Co. for a number of years. Between 1934 and 1937 he was a consulting engineer at the Moscow Dynamo Works, being engaged mainly on projects for the electrification of Russian main line railways.

Professor Arnold Tustin

Congratulations on his 50 years continuous service were recently conveyed to **Mr. H. H. Eaton** of Lancashire Dynamo and Crypto Ltd. Mr. Eaton is manager of the Estimating Department at the company's Trafford Park works, a position which he had held for twenty-one years.

Mr. R. W. Lord, manager of Henley's (South Africa) Telegraph Works Co., Ltd., has been appointed a director of the company. That concern is a wholly owned subsidiary of W. T. Henley's Telegraph Works Co., Ltd., with whom Mr. Lord commenced his career in 1920. He was appointed assistant manager of the subsidiary in South Africa in 1939, and manager in 1947.

OBITUARY

Mr. Charles D. Le Maistre, C.B.E., F.C.G.I., M.I.E.E., A.M.Inst.C.E., general secretary of the International Electrotechnical Commission, and formerly of the British Standards Institution, died on July 5, aged 79. He was widely known for his work on international documentation—and only three weeks ago we noted the second foreign award bestowed upon him in recognition of his valuable activities in that sphere.

Mr. C. F. Phillips, M.I.E.E., who died on July 1, aged 67, was a prominent experimenter in the early days of wireless—he had his own transmitter, and founded the firm of Burndept Ltd. In 1921 he was appointed a member of the Post Office Committee which handled the formation of the B.B.C. He played an active part in the Radio Section of the I.E.E., and also served on the Technical Wireless Regulations sub-committee of the Committee of Imperial Defence in connection with the Washington Conference of 1927. He

joined Graham Amplion Ltd., in 1928, as chief engineer and became a director of that company and of Alfred Graham and Co. In 1932 he established himself as a consulting engineer. A keen philatelist, he was also for a time, chairman of Stanley Gibbons Ltd.

Mr. H. M. Hibberd, a director and works manager of Belling and Co. Ltd., died on June 26, aged 61. He was educated at Stafford Grammar School and received early training with Siemens Brothers. After war service he joined the Domestic Appliance Works of the General Electric Co. in 1920 with whom he held various positions including that of assistant works manager of the Cooker and Appliance works in Birmingham, a position he relinquished to go to Belling and Co. Ltd., as works manager in 1938. He was a member of the Institute of Vitreous Enamellers, the Institute of British Foundrymen and the Institute of Works Managers Ltd.

Controversy over Boiler Contracts

THE matter of tenders for two 60 MW turbo-alternators and seven boilers with ancillary equipment for the new power station, was discussed at some length at last week's meeting of Belfast City Council, when it was decided to refer the tenders back to the Electricity Committee with a view to consulting the Ministry of Commerce. The matter is to come before a special meeting of the Corporation.

In May, the committee after considering tenders quoted on invitation, recommended placing contracts with C. A. Parsons and Co., for two turbo-alternators, transformers and condensing plant for £1,470,593, and with Babcock and Wilcox for seven boilers and ancillary equipment for £2,976,496. At a subsequent meeting of the committee it was decided, by five votes to four, to rescind those decisions and to invite tenders by public advertisement. At that meeting a letter was read from Mitchell Engineering Ltd., stating that if they had been asked to quote for the boilers their price would have been £2,750,000, and the boilers could have been steaming in 44 months. The position of the committee in regard to advertising or taking all reasonable steps to obtain tenders after widespread competition, was fully explained. The committee also sought the opinion of Sir John Hacking as to the reasonableness of the prices quoted in the five tenders received for the boilers.

At last week's Council meeting Sir William Neill urged the Council to reject the Electricity Committee's proposal to ask for more tenders for the boiler plant. He maintained that the intervention by a contractor who was not invited to tender was completely out of order, and to call for fresh tenders now would involve months of delay. The price of the accepted tenders had been approved as reasonable by the consulting engineers, Merz and McLellan, and the procedure of a negotiated price had been in operation since 1936.

Belfast's Lord Mayor, Ald. P. Brown, then mentioned a letter from the Minister of Commerce, referring to the Electricity Committee's proposal to rescind its earlier decision and advertise the contracts. The Minister was gravely concerned at the possible delay of the power station work which might result, and emphasised that if load-shedding was to be avoided, at least one turbo-alternator with boiler plant should be in commission by the beginning of the 1956-57 winter.

Consultants Questioned

Alderman M'Kee said that in October 1952 it was decided to advertise the work, but in February 1953 the consultants recommended that invitations to tender should be confined to five firms. It now transpires, he went on, that many on the committee thought there were only five firms capable of doing the work, but there were 12 boiler-makers in the U.K., half of them in a "ring" and half outside. The consultants had failed to give a satisfactory explanation why all 12 firms had not been invited, other than that, to analyse 12 tenders would have taken longer than to analyse five, he said. When the Electricity Committee heard of the offer of Mitchell Engineering, the consultants, were questioned. They stated that the firm were very reputable, but they seemed to doubt any possibility of a big reduction in price. Great play was made at the committee by some members that it was unfair of Mitchells to submit a price after the five tenders were in, but it was not until the last meeting of the Electricity Committee that it was discovered that Mitchells had written to the consultants prior to any prices being received and, without reference to the Council, were refused permission to quote. Had the Council known that there were so few boiler-makers in the U.K. they would have insisted on all being invited to quote, and had they known that Mitchells were anxious to quote at 10% lower they would have thrown open their arms in welcome, Ald. M'Kee declared.

NEW LITERATURE

Laxton's Builders' Price Book

IN this very useful annual, which many in the contracting industry find of considerable assistance, all the prices have been analysed afresh in the light of present-day conditions. As far as wages are concerned, these are based on the rates operating in February 1953. The general layout is the same as in previous editions, including an expanded list of trade names met in the building industry, together with an alphabetical collation of firms and their addresses. Published by Kelly's Directories Ltd., 272 pages, 7¼ in. by 4¾ in., Price 30s.

Radio Engineering (Vol. 2)

by E. K. Sandeman

NOW in its second edition—the first was published in 1949—this book is well on the way to becoming the classic book on Radio Engineering. The volume has been completely revised and those parts dealing with B.B.C. practices brought up-to-date. The only substantial additions is the introduction of a section on transmission line filters, and a statement on the method of calculating the noise factor of a receiver has also been added.

It may be remembered that the book was derived primarily from an instruction for the training of maintenance engineers at B.B.C. stations but was subsequently extended to constitute a book of reference for experienced engineers. Published by Chapman and Hall, 613 pp., 5½ in. by 8½ in. Second edition, price 55s.

Photo-Electric Multipliers

by S. Rodda

THE phenomenon of secondary emission has long been known, but it is only in recent years that it has been successfully applied as an amplifying function in certain types of tube. In the photo-electric tube, electrons, provoked into leaving a cathode by the incidence of light, can be multiplied successively by stages of secondary emission, reaching a value of many million times that of their original number. This technique allows extremely small quantities of light to be detected. Hitherto details of these interesting devices have been mainly confined to technical papers, but in view of their increasing importance Mr. Rodda, has now consolidated much of this matter in this book. Concentration is placed mainly on the underlying physical principle of the phenomenon, and not on the auxiliary equipment required. Published by Macdonald and Co., London, 180 pages, 5½ in. by 8½ in. Price 22s. 6d.

Essentials of Microwaves

by R. B. Muchmore

DEALING with a subject which has often been presented as an abstruse mathematical exercise, the author sets out from the first sentence to portray his quantities as physical entities in an endeavour to ensure that the lesser mathematician can follow his arguments without difficulty. That he succeeds is without doubt, despite the mathematics which must, on occasion, be introduced, but it should be borne in mind that there is assumed, in the reader, a thorough knowledge of the fundamental, empirical laws of electricity and magnetism. From this basis the study of microwave phenomena, applications and apparatus is considered. On both a general and particular basis, waves, waveguide cavity resonators, filters and aerials are in turn discussed before a more detailed study of power generators and amplifiers, which includes the klystron and magnetron among others. Chapters on noises, relaying and radar bring the book to a close. Published by Chapman and Hall, 236 pages, 9 in. by 5¾ in. Price 36s.

Transformers and Rectifiers

edited by E. Molloy

IN a treatment which is concise yet comprehensive, this volume—fifth in the publisher's Practical Electrical Engineering Series—with its wide variety of subject matter, has omitted little of value to the practical power engineer. Opening with a survey of transformer types, which covers briefly the range likely to be met in service, the work continues with a discussion of transformer connections, including connections for different phase systems. Small transformers are considered, from the viewpoint of their design and construction, which lead to treatises on units for industrial purposes and the maintenance and testing of h.t. power transformers. This section of the book concludes with an outline of instrument transformers. It is natural that the bulk of the second section concerns itself with mercury arc rectifiers, dealing with types, their operation and applications. Finally, the closing chapter ranges, somewhat briefly, over a comprehensive variety of metal rectifiers. Published by Geo. Newnes, 164 pages, size 9 in. by 6 in. Price 17s. 6d.

BOOKS RECEIVED

The Magnetic Circuit, by A. E. De Barr. Monograph for general reading by students discusses effect of magnetic circuit on constituent materials. Published in Monographs for Students series by The Institute of Physics, 47 Belgrave Square, S.W.1, 64 pages, size 7¼ in. by 4¾ in. Price 5s.

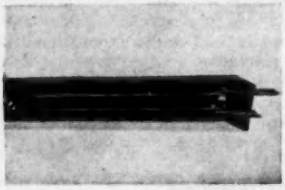
Soft Magnetic Material Used in Industry, by A. E. De Barr. Monograph for general reading by students emphasising physical basis of magnetic materials. Published in Monographs for Students series by The Institute of Physics, 47, Belgrave Sq., S.W.1, 64 pages, size 7¼ in. by 4¾ in. Price 5s.

Fundamentals of Thermometry, by J. A. Hall. Monograph for general reading by students, attention paid to practical temperature scales and instruments. Published in the Monograph for Students series by The Institute of Physics, 48 pages, size 7¼ in. by 4¾ in. Price 5s.

The BUYER'S *Column*

Bus-bars for Soldering Irons

AN interesting introduction by ELECTRICAL REMOTE CONTROL CO., LTD., East Industrial Estate, Harlow New Town, Essex, is the low-voltage soldering-iron bus-bar installation which has just arrived on the market.



The makers consider that results so far have marked a revolutionary development in the technique of production soldering—most certainly the installation has some important points in favour of its adoption.

Standard U-shaped, grey painted, steel channel protects two solid copper bus-bars on Bakelite insulators. These are fed from a 1 kVA. 230 V, single-phase mains unit, comprising a double-wound, air-cooled transformer with a control panel and have a current capacity of approximately 160 amps.

Usually the bus-bars are supplied in 6 ft lengths and are easily joined. Standard two-pin plugs, modified by special shaping of the pins to give a firm grip on the bars (they will not now fit the usual mains socket), afford the outlet point for supplies, to soldering-irons, which are usually 20 V, although as centre tapping of secondary is earthed, maximum bus to earth voltage is 10 V.

Ease of installation, simplicity of design and the factor of safety inherent in low-voltage operation are factors commending the adoption of this system.

Price Changes

NEW price lists issued by SIMPLEX ELECTRIC CO. LTD., Broadwell, Oldbury, give revised prices for conduit fittings (CF1983) and alterations to various other lists covering conduits, switch and fuse gear, underfloor duct systems, cooker control units (leaflet PR 1984). These new lists have effect from July 1.

List prices of Wylex switch fuse control units have also been revised as from July 1; these are now set out in leaflet W881 published by GEO. H. SCHOLES AND CO., LTD., Wylex Works, Wythenshaw, Manchester.

New prices are announced for the radio and T.V. receivers marketed by Stella Radio and Television Co. Ltd., 9-15 Oxford St., W.1. These are as follows :

Model ST.101U	£16 10s. inc. tax	(reduction of	3d.)
Model ST.102A	£18 18s. inc. tax	(,, ,,	9d.)
Model ST.151A	£28 0s. inc. tax	(,, ,,	3s. 4d.)
Model ST.305A	£72 9s. inc. tax	(,, ,,	8s. 0d.)

Floor Drying the "Dixon" Way

LATEST addition to the range of industrial and commercial power floor cleaning equipment supplied by COLUMBUS-DIXON LTD., Capitol Works, Empire Way, Wembley, Middx., is the 24 in. Capitol power floor drier.

This machine with its extra wide 24 in. nozzle makes possible the perfect drying of 7,000 sq ft per hour of any type of floor and the powerful 3/5ths h.p. motor ensures that all dirt, grease and water, even from cracked and uneven factory floors, are sucked up into the tank.

Equipped with a power water ejector and self-cleaning tank, which eliminate the need for drainage and prevent clogging by silt deposits, the 24 in. Capitol can be either pushed or pulled, thus facilitating its use by unskilled labour.

Another exclusive feature of the 24 in. Capitol is the combined scrubbing and drying hand attachment which enables inaccessible corners under benches, etc. to be scrubbed and then dried in one simple operation. Its low overall size and ease of manoeuvrability enable the new floor drier with the Dixon floor scrubber to clean greater areas whilst the special nozzle design dries floors right up to the wall and into corners.

Factory floors come really dry and clean with the Dixon 24 in. Capitol drier

The Creda Redhead

LATEST addition to the Creda range of water heating equipment is the "Redhead" immersion heater, just introduced by SIMPLEX ELECTRIC CO. LTD., Creda Works, Blythe Bridge, Staffs.

As a step towards low cost the firm decided on a design which made the best use of raw materials available and then decided to produce at first only a limited range of immersed lengths and loadings. The "Redhead" is, therefore, available only in six sizes: 11½, 14, 18, 24, 27 and 30 inches.

Heating element of the "Redhead" is a helically coiled wire of 80/20 nickel chromium compacted in insulating powder and contained in a de-oxidised non-arsenical copper tube. In long elements for vertical mounting, the heating wire is concentrated in the lower part of the tube to affect a more uniform vertical temperature distribution, but in the short-tube type it is distributed evenly along the length of the tube. For voltages 210 V (covering 200-220 V) and 240 V (230-250 V) and rated at 3 kW loading the "Redhead" is available with or without thermostats. In the latter type, however, sockets are fitted.

"Cowanite" Fights Rust

A PURE zinc and rubber latex protective material for iron and steel which inhibits rust and corrosion and can be applied irrespective of size and site is now available under the name "Cowanite," from COWANITE (ANTI-CORROSIVE) LTD., 15 Tithebarn Street, Liverpool 2.

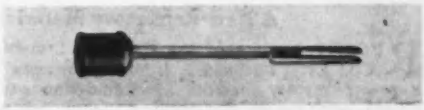
"Cowanite" can be applied over adherent rust or millscale, and through its high zinc content will prolong indefinitely the life of iron and steel, as the zinc will penetrate to all parts of the surface and thus ensure uniform protection. For this reason it can be applied to concave section material which might prove difficult to hot dip or electroplate. It can be applied either by brushing or spraying, is touch-dry in 14 minutes, and hard-dry in 40 minutes, and has a covering capacity similar to good-class paint.

Its great advantage over other processes, such as hot galvanising, electroplating, etc., is that these processes require a clean surface which must be achieved by the costly processes of chemical action or shot blasting, whereas "Cowanite" requires no such preparation.

New Range of Thermostats

NOW available from PROCESS CONTROL GEAR LTD., 56 Victoria St., St. Albans, Herts, is a completely new range of immersion thermostats for both domestic and industrial purposes. Standard type NU 2 of conventional pattern conforms to BS.1555, and is suitable for either separate mounting or for fixing in the apparatus plate.

Where there is a need for minimum dimensions the company have developed the NU 2-C. This is for direct connection to the tails of the heating elements of automatic immersion heaters, whereby terminal plates and interconnections are eliminated and a saving of space and cost achieved. Apart from the connections to heating elements all connections are made internally in the thermostat head.



The Creda "Redhead" immersion heater

For industrial users there is the NU 2 standard 2 contact thermostat, which opens circuit on rise of temperature. Type NU 3 is the 3-contactor automatic changeover instrument, whilst type NU 3H is designed for control applications where it is necessary for the instrument to remain out until re-set manually. Special instruments are made for high temperature up to 550° F, with inactive portions and boss extension pockets. Protecting covers are available where watertight conditions are present and there is a full range of boiler instruments suitably protected and fitted with external adjustments. Microgap switches are enclosed in maroon colour mouldings.

Store Fittings using new 75W Spotlight

DESIGNED to suit the new 75 W internally silvered spotlight lamp introduced by many firms just recently are two ranges of lighting fittings announced by COURTNEY POPE (ELECTRICAL) LTD., Amhurst Park Works, Tottenham, N.15.

The "Petite" range includes designs incorporating contemporary "bell" and "cone" shaped reflectors either top or side mounted. Lengths of shades range between 5⅛ in. and 7 in. with diameters 4⅞ in. to 5 in. Prices range between £1 5s. and £1 18s. 6d. for the fittings with standard finishes of cream enamel or anodised aluminium, special finishes being available on application. Louvers, both flat concentric type and three-tier, are available at 7s. and 10s. 6d. list respectively.

An additional advantage of these fittings is that they can be used with standard general service lamps, neck reflectors for use with such lamps being obtainable at 5s. 6d. each list.

The "Gimbaliter" range, which can be supplied recessed, semi-recessed or surface mounted, includes the E.S/2 fitting at £2 15s. which will take either the 150 W or 75 W internally silvered lamp, while the E.S/3 takes 150 W G.S. or 60 W, 100 W or 150 W Pearl lamps at £2 15s. again. The E.S4/R takes a 24 V 60 W s.b.c. lamp giving a much higher intensity of light for special applications.

Now, a Small Osram I.S. Reflector Lamp

AN Osram 75 W spotlight lamp with internally silvered reflector is now available, say the GENERAL ELECTRIC CO. LTD., Magnet House, Kingsway, W.C.2.

The average life of this 75 W lamp is equivalent to that of general lighting service types and the light distribution is broadly similar to that of the 150 W reflector lamp. Price is 8s. plus 1s. 5d. p.t.

A New Refractory Material

RECENT product of the FURNACE LININGS CO., LTD., Sheffield 3, is "Pinnaconcrete," a new refractory material for foundation and linings of furnaces, hearths and doors, boiler baffles, etc., and for all types of pre-cast work. It will withstand temperatures up to 1,400° C, and, say the makers, there is no spalling even under the most severe furnace conditions or rapid changes of temperature, and in addition practically no shrinkage or after-contraction.

It should be prepared as ordinary concrete, but water should not be added any length of time before use because "Pinnaconcrete" sets rapidly on addition of water. After mixing and a stand of 20 minutes the concrete is ready for use. It can be poured into moulds or shutters as with the ordinary material, or used for cold repair work and patching.

Mobile Rectifier Units

MANUFACTURERS of transformers, battery chargers and rectifying equipment, CAYSON ELECTRICS LTD., Queens Road, Watford, Herts, have recently completed an order for a batch of mobile rectifiers for operation at military aerodromes.

These heavy-duty units are designed for easy transportation between hangars and are used in conjunction with low-voltage air-conditioning fans drawing of heavy engine exhaust fumes.

They are designed for operation from a 220 V, 3-phase, 60 c/s supply and have a rectified output 28 V 200 amps.

The transformer is double-wound, air cooled, to B.S.S. 171/1936, the primary being star connected and secondary delta. Incorporated are nine banks of selenium rectifiers in parallel bridge.

TRADE PUBLICATIONS

SWITCH AND FUSEGEAR.—Seventy-sixth issue of "Wylex Armchair" features Wylex Switch Fuse Control Units.—Geo. H. Scholes and Co., Ltd., Wylex Works. Wythenshawe, Manchester.

CABLES.—Lightweight colliery telephone and signalling cables are featured in publication 329, issued by British Insulated Callender's Cables Ltd., 21 Bloomsbury St., London, W.C.1.

MINE SIGNALS.—The certified Staple Shaft Mine Signalling System which is produced by Automatic Telephone and Electric Co. Ltd., Strowger Works, Liverpool 7, is surveyed in publication 1200.

ACCESSORIES. — Price List No. 24 gives new prices as from June 1, 1953, for all products of Nettle Accessories Ltd., Harper Road, Wythenshawe, Manchester.

PUMPING.—"Suction supply conditions for pumping installations" is the title of a new publication by G. and J. Weir Ltd., Cathcart, Glasgow. It is a reprint from the Transaction of the Institute of Marine Engineers of a paper by H. Hillier, O.B.E., M.I.Mech.E., M.I.Mar.E.

POWER CONTROL.—New publication by Standard Telephones and Cables Ltd., North Woolwich, E.16—A/PF19 deals with automatic p.f. correction regulator for multi-stage capacitor switching.

RECTIFIERS.—Leaflet F/CU.1 recently issued by Standard Telephones and Cables Ltd., Warwick Road, Boreham Wood, Herts, describes automatic battery charging control units.

RELAYS.—Individual relay units for different purposes in remote control work developed by Standard Telephones and Cables Ltd., Oakleigh Road, New Southgate N.11, are described in publication D/RC 25.

LABORATORY EQUIPMENT.—The Rovac laboratory filter is a working reproduction of the larger Rovac machine and forms an ideal unit for laboratory and pilot plant. It is described in publication G.538 by International Combustion Ltd., 19 Woburn Place, W.C.1.

TRANSMISSION.—Electric telegraph distortion measuring equipment made by Standard Telephones and Cables Ltd., North Woolwich, E 16, is described in publication C/TT 15. Another new publication from the same division describes a 24 channel amplitude modulated voice frequency telegraph system TA 4.

AIR HEATING.—An attractive new publication W537 issued by International Combustion Ltd., 19 Woburn Place London W.C.1, surveys the development properties and applications of USCO plate type air heaters.

BOILER EQUIPMENT.—The type "L" travelling grate stoker and a summary of the features which make it outstanding are featured in new publication S535, issued by International Combustion Ltd., 19 Woburn Place, London W.C.1.

INDUSTRIAL GRINDING.—The Hardinge Conical Mill and its construction performance and application in industry is featured in new publication G 525, issued by International Combustion Ltd., 19 Woburn Place, London W.C.1.

ELECTRIC CLOCKS.—An entirely new issue of the catalogue covering the Company's range of synchronous mains-operated clock has been published by Gent and Co., Ltd., Faraday Works, Leicester.

BELT DRIVES.—Plain facts on the care of V-Belts are stated in a booklet of this name just published by British Tyre and Rubber Co. Ltd., Herga House, Vincent Square. London S.W.1.

The WEEK in NEWS

Australia Allows More Imports

Further Relaxation of Controls Announced

THERE was good news last week-end for British exporters interested in the Australian market. Further relaxations in Australian import restrictions have been announced in Canberra by the acting Prime Minister, Sir Arthur Fadden, thus giving added weight to the general opinion that the restrictions will be removed entirely later this year. An indication that the ban would be eased further, and that there will be no further impositions after October, was given in these columns last week. Sir Arthur Fadden's announcement is in accordance with the Australian Government's policy to relax and eventually remove import controls as soon as the country's international reserves and balance of payments prospects improve.

As from last week-end the permissible level of imports in Category A goods will be raised from 70% to 80% of the value of imports in 1950-51, and for goods in Category B the amount will be raised by 10% to 40%. Appropriate adjustments will be made to goods licences under administrative arrangements. These concessions do not apply to items from Japan or dollar sources.

Included among category A items are the majority of electrical domestic appliances such as washing machines and refrigerators, whilst in category B are such goods as wire, switchboards and car batteries.

Sir Arthur commented that additional imports will allow a sufficient flow of raw materials and plant to meet local producers' needs. Stocks of imported finished goods, he said, had been declining and shortages were appearing in some cases. Restrictions were first imposed in March, last year, but their full effect was not felt immediately. Restrictions were eased by about £A50 m. a year last April. This new relaxation will probably help merchants to increase orders for Christmas.

Pre-Coronation Sales of T.V. Sets

SALES of television sets which rose slightly during March, increased rapidly during April, according to the R.T.R.A. index for that month just issued. In fact the number sold was nearly three times larger than in the corresponding month in 1952. Main factor responsible for the increase was of course the Coronation, and this was encouraged by the Budget announcement on purchase tax. Radio sales showed a slight increase both on the previous month and on the April 1952 figure. Actual figures for April sales were 5·68 as regards radio sets, as compared with 5·3 in March and 5·44 in April 1952, and 10·22 as regards TV sets. The latter was a rise of 1·91 over March and compared with 3·72 sets sold in April last year.

Electrical Exhibition Expanding Again

WE hear from the general secretary of A.S.E.E. that the number of reservations for space at next year's Electrical Engineers Exhibition makes it quite clear that demands for reservations will exceed those for the second exhibition held last March. This indication comes within a very short time of the Exhibition Organising Committee sending questionnaires to manufacturers. All who participated last March are enthusiastically in favour of the next one. The committee is now arranging new financial and administrative bases for the next show.

Free Grates for Smokeless Fuel Users

WE heard last week that a northern firm is embarking on a remarkable publicity stunt. The company, we understand, are to offer free, grates burning smokeless fuel, on condition that the recipient buys smokeless fuel from the firm concerned. The company also undertakes to keep its customer constantly supplied with the coal. It has been suggested in the past by advocates of solid fuel, that the Government would be likely to benefit in the long run by an issue of efficient stoves.

The First Half Century

At this time of year, and especially during Henley week, electrically-propelled launches form a not inconsiderable proportion of the river traffic. Noiseless, speedy, clean and without smell or heat, the electric launch is ideal for river motoring, just as the electric carriage is without a peer for town use on land, and it is therefore not surprising that the popularity of this class of motor boat should have kept pace with that of the electromobile.—*From our issue of July 9, 1903.*

Industrial Tariff Complaint Sent to B.E.A.

THE Eastern Electricity Board has failed to satisfy the Area's Consultative Council concerning the fairness of its new industrial tariff. Particular cause of contention has been in the Board's decision to alter the running charge in the coal cost adjustment clause.

The Council has accordingly decided to pass their disagreement on to the B.E.A., and have passed a resolution to that effect. The resolution states that the Council cannot agree with the Board that the suggested reduction adequately represents the difference between costs of supply to h.v. and l.v. consumers, and nor can they agree that the ·0008d coal clause increment is correct for both types of consumer between 38s. and 65s. per ton fuel costs. A case in support of this resolution is being prepared. This matter was given prominence when the Council reported their findings in the dispute between the Board and both Enfield Rolling Mills Ltd. and Associated Portland Cement Manufacturers Ltd. (see our May 21 issue).

As regards this dispute, chairman Ald. W. J. Bennett remarked at last Friday's meeting of the Council, on the fact that certain detailed information had been reported in the Press evidently in advance of communications from the Board to the particular consumers. This, he said, emphasised the Council's independence and exemplified the fact that the Council was in no way controlled or directed by the Board. Ald. Bennett said it was important to recognise that all matters before the Council were dealt with in public and that it would be most unfortunate if the protection of consumers was performed in secret. The Board's chairman has endorsed this latter view and reiterated that the Board acted correctly in the matter.

Among other matters raised at the same meeting was the question of different Board's selling identical electrical appliances on varying hire-purchase terms. The Council could not accept the Board's explanation as to why varying terms existed from area to area and decided to make further representations. It was also reported that the Board had installed recording apparatus in homes and institutions in an effort to discover whether these premises were domestic or commercial.

E.I.B.A. Garden Fete

THE B.E.A.'s Training Establishment, Horsley Towers, in Surrey, was the scene of a most successful garden fete held on June 27 in aid of E.I.B.A. The function was organised by the Horsley Towers Club and the E.I.B.A.'s Surrey committee. About 2,000 visitors attended. Prominent among the guests were Lord Citrine and Lady Citrine, who presented prizes.

Our photograph shows one of a new fleet of specially designed road tankers put into service by Shell-Mex and B.P. Ltd. for delivery of electrical insulating oils. In transport of this oil all contact with moist air, dust and dirt must be prevented. Use of special self-sealing couplings, vent valves, and dehydrating breathers facilitates filling and discharge with air humidity effects eliminated and no undue disturbance of the oil. Also, filling and discharge is independent of the vehicle's engine

OFFICIAL PUBLICATIONS

E.R.A. REPORTS: A/T137: Examination of Self-Supporting Films of Cellulose Triacetate, Cellulose Acetate Butyrate and Polythene, 10s. 9d.; G/T270: Breaking Capacity Tests of 440 V, 150 A and 75 A Three-phase Contactors, by H. W. Baxter and B. Hopwood, 15s. 5d.; G/T276: Flameproof Electrical Apparatus—Flanged Joints, One Half-Inch in Radial Breadth, in Mixtures of Ethylene and Air, by H. Robinson, J. T. W. Roper and H. L. Williams, 7s. 9d.; G/T277: Flameproof Electrical Apparatus—Flanged Joints, One Half-Inch in Radial Breadth, in Mixtures of Ethyl Ether Vapour and Air, by H. Robinson, J. T. W. Roper and N. Simpson, 10s. 9d.; V/T108: Detection of Incipient Failure of Insulation by Observations of Non-Linearity, by G. Mole, 24s. 4d.; V/T115 Design and Performance of a Portable A.C. Discharge Detector, by G. Mole, 15s. 3d.

CONTROL OF ALUMINIUM (Revocation) ORDER. S.I.1001. H.M.S.O., 2d.

MONOPOLIES AND RESTRICTIVE PRACTICES COMMISSION BILL. Govt. Bill introduced to Parliament (see page 87). H.M.S.O., 6d.

BRITISH STANDARDS YEARBOOK, 1953. Available from B.S.I., 24 Victoria St., S.W.1, 12s. 6d.

TIN RESEARCH. Report for 1952 of Tin Research Inst., Fraser Rd., Greenford, Middx. (see below.)

FIRE RESEARCH BOARD. Report for 1952, with report of Director of Fire Research and survey of 1947-52. Published by D.S.I.R. H.M.S.O. 3s.

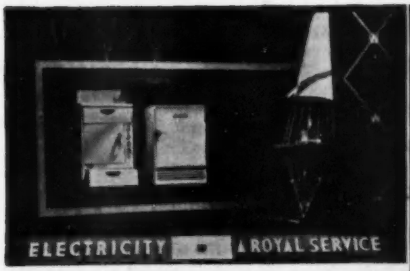
Tin Research in 1952

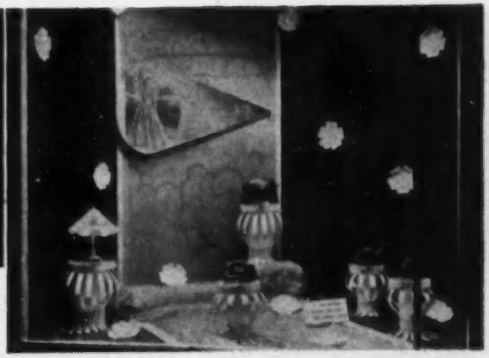
IN the annual report of the Tin Research Institute for 1952, mention is made of progress in the development of tin-nickel alloy plating, a coating whose chief value is its hardness and resistance to tarnish.

Although the process was invented some two years ago, considerable difficulty has been experienced in exploiting it on a large scale due mainly to corrosive properties of the hot plating solution and the necessity of keeping it free of suspended solids.

During the last year, however, a satisfactory filtering procedure has been developed, which enabled pilot schemes to operate successfully.

Progress with tin-zinc alloy plating and speculum electroplating is also reported.





Winning display in the L.E.B.'s annual competition is that of the Edgware Road showroom, above. Right is the window at Highams Park service centre

Best L.E.B. Display in Edgware Road

THE third annual window display competition organised by the London Electricity Board has been won by the Edgware Road service centre. The contest was held in April and was open to the staffs of all showrooms in the Area. Some 50 entries were received, and 14 of these were selected by senior officers of the Board and submitted to the final judging panel. Second place was taken by the service centre at Highams Park, while Putney won third place. The last mentioned consisted of a large-sized jewel box, opened to reveal all kinds of electrical apparatus from a refrigerator to a mixer. The display was captioned "Jewels for your Home." The shield and certificates were presented to the winners on July 1 by Mr. H. J. Randall.

Window Display League

A NOVEL kind of window-display competition is being held by the S.W. Scotland Electricity Board. Contests are held every two months and marks awarded for each display. A year's record is maintained in the form of a league table and at the end of the "season" prizes awarded to the staffs in centres occupying first three places in the league. Themes are chosen at Area H.Q. It appears that the system has proved remarkably successful in every way.

Japanese Influence on World Markets

BASIS of the Overseas Economic Survey of Japan, recently published by H.M.S.O., is not so much the prospects that country holds for U.K. manufacturers, but the effect the Japanese are having on world markets. Before the war she could undercut most countries and in some items she is beginning to do so again. Japan's experience, however, was gained from foreigners, and as a result of hostilities she now lags behind in experience and knowledge, especially as regards machinery, but although about ten years behind at present, severe competition may be expected in the future. Before the war also, Japan had become largely independent in production of electrical equipment. It was in the hands of a few large firms, and although those large concentrations of capital have been dispersed, the 1939 position is fast returning. There is much lee-way to make up and, as elsewhere, hydro-electric equipment suffered from lack of replacement and from overloading.

Hydro-electric power is readily available and has been well developed. Nearly every district has a supply of electricity near at hand because of wide distribution of generation. Total H.-E. generation in 1951 was about 3,131 m kWh, but at the end of that year there was an acute shortage. Causes of this were said to be drought, low coal stocks, and the remarkable increase in both industrial and domestic consumption. As a result first stages of large-scale development plans formulated by the Government's Public Utilities Commission for both hydro- and thermal generation were put into operation. Under a five-year plan, 1952-56, new hydro-electric development of 5·7 m kW is anticipated.

Five-Day School on Analysers and Computers

CITY and Guilds College gave details last week-end of this year's Vacation School in the electrical engineering department of the Imperial College of Science and Technology. Subject will be "Analysers and Computers for Electrical Systems," and the course will take place between July 13 and 17. Object of the School is to encourage the use of analysers and computers for solving the problems arising in the design and application of machines control systems and power networks. Number of participants will be limited to 60 and the fee will be £8 8s. There are eight lectures being arranged, all by prominent personalities in various concerns in the industry or from Imperial College. Introductory talk will be by Mr. F. J. Lane of the B.E.A. Discussions are to follow each lecture and will, in most cases, last about an hour. During the School a visit will be paid to a computing laboratory.

Board Cuts Cost of Water Heater Installation

FOLLOWING consultations with manufacturers of immersion heaters and lagging jackets, domestic consumers in the N. Western Electricity Board's Area are being offered a standard immersion heater installation at an all-in fixed price of £15. Hitherto the cost of such an installation has been about £20. With the offer goes an appeal advocating the use of the heaters as a means of saving fuel. It is pointed out that the system is an efficient one and particularly significant in view of the anxiety about supplies of house coal next winter. Consumers are being told that use of the heaters in summer conserves coal stocks for the winter, and use in winter means that poor quality coal is being used in power stations instead of good quality in domestic grates.

Installation itself comprises a "top-entry" immersion heater, fixing and plumbing, supply and fixing of lagging jacket, and wiring of a separate circuit up to length of 50 ft. If other work is needed a proportionate charge will be made. In terms of hard cash this offer meaps that the heater has been brought within a few shillings of its pre-war price.

It will be recalled that only last week we reported that the E. Midlands Board is again offering to hire out immersion heaters at weekly rentals

COMMITTEE TO STAY

SCOTTISH Fuel Efficiency Committee has been asked by the Ministry of Fuel and Power to carry on for another year despite the fact that it was to have been disbanded in October, and a Government sponsored organisation was being formed. This voluntary committee is to remain to complete schemes and plans for the year.

Houses Wired—but No Electricity

SHORTAGE of capital available to the Midlands Electricity Board is causing a severe test of patience among residents on an estate at Dudley, it was reported at last week's meeting of the town council. Facts of the situation are that about 18 months ago some 200 houses on the Priory estate were wired for electricity, but at present there is no sign of any connection to the grid. The M.E.B. have stated that they have not sufficient money to carry out the connection, but it was hoped the job would be done in six months. As Ald. A. M. Silcox explained, the Board had to obtain permission to spend money like any other authority, and its current allowance had been allocated.

Liverpool Course on Electric Arc

ARRANGEMENTS are being made by the Departments of Extra-Mural Studies and Electric Power Engineering at Liverpool University for a course of eight lectures on the Theory and Applications of the Electric Arc. Lecturer will be Dr. H. Edels, at present carrying out research on these problems and formerly with English Electric Ltd. The course will take place at the University on Tuesday evenings beginning on October 13, and the fee will be £2 2s. Briefly, the lectures will describe the electrical, optical, thermal, and gaseous properties of the electric arc, and then apply this experimental and theoretical data to a study of the behaviour of arcs in engineering practice. Any further particulars may be had from Director of Extra-Mural Studies, 9 Abercromby Sq., Liverpool 7.

Reward for Long Service

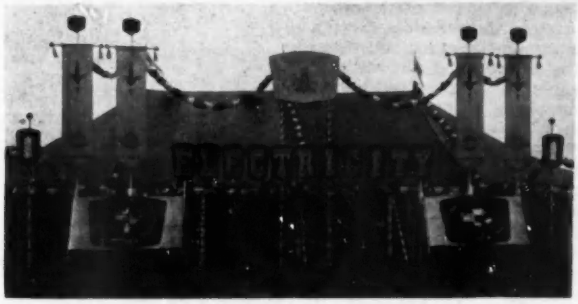
SIXTY-NINE long-service awards will be presented to employees of the North-Eastern Group of Companies, comprising N.E. Marine Engineering Co. (1938) Ltd., George Clark (1938) Ltd., and Richardsons, Westgarth (Hartlepool) Ltd., on Saturday. The event will follow similar ceremonies in 1952, when 77 awards were given, and 1951 when 646 were presented.

BEST LIT CITY?

Singapore is now probably one of the best lit cities in the East and its main streets can boast some of the most up-to-date installations comparable to almost any modern city. Following the original schemes carried out in 1951, further fluorescent street lights have been installed. Equipment was again supplied by the British Thomson-Houston Co., Ltd. SLC 750 type lanterns housing 5 ft tubes being erected in Raffles Place and Collyer Quay. The accompanying illustration shows a view along the latter road. In addition, S.L.3500 lanterns with 2 ft tubes have been installed in Tiong Bharu area and Alexandra Road. Over 160 fluorescent lanterns are now operating along Singapore's main thoroughfares

If we may be excused saying so, the S.E. Scotland Electricity Board and E.D.A. really went to town with their stand at the Royal Highland Agricultural Show. The imposing stand pictured here occupied 7,200 sq ft and housed the largest display of electrical equipment yet seen at the event. Reports indicate that their efforts were well rewarded as attendance was remarkably good on all four days

Below is the S.E. Electricity Board's stand at the Kent County Agricultural Show at Maidstone last week. The same stand will be shown again at the Sussex Show to be held next week



Electricity Supplies to New Housing Estates

SCARCELY a day passes without reports reaching us from one part of the country or another on local councils' dilemma concerning installations of electricity and/or gas supplies in council houses. One of the most recent reports comes from Truro where it has been suggested that the procedure of assessing capital contributions from local authorities should be revised. The whole question of electricity supplies to new housing estates is now being discussed at national level and the Area Boards are understood to be preparing a memorandum outlining their views. This is destined for the Ministry of Housing but will have to be submitted to the Fuel and Power Ministry. Truro Council received a reply to the effect that the matter was a national one.

In the meantime, local authorities in other parts of the country continue their discussions on the subject. Inverness' Housing Committee has decided to continue installing electric and gas cookers instead of leaving the choice to the tenants. Stone (Staffs) Council has decided against the inclusion of gas in one of their housing schemes. The houses will be all-electric. The decision was subject to the Electricity Board's agreeing that no charge be made. At Melton, a recommendation that no cooking facilities at all should be provided on a new estate was referred back.

Embargo on Repairs

IT is reported from Haltwhistle (Northumberland) that the 300 tenants of the rural council will in future be responsible for minor electrical repairs. In spite of objections it has also been decided that only electricians approved by the council, may be employed by tenants to carry out repairs.

ELECTRICITY CRITICISED

IT is perhaps unfortunate from the electricity supply industry's point of view that the person chosen to write on the future of power supplies in this country in the *Financial Times* commemorative survey of British economy was Prof. F. E. Simon. The Professor is noted for his advocacy of solid fuel, and it is thus hardly surprising to find it stated that coal must be used whenever possible and electricity only when indispensable. Of the supply industry's fine record in the face of many difficulties there is hardly a word, and no attempt is made to assess basic factors affecting public supply today. In the same publication, Sir George Nelson contributed a review of two generations of progress in the electrical engineering industry.

A.E.M.T. has Good Year

A SATISFACTORY year was the general and confirmed opinion expressed at the annual meeting of the Association of Electrical Machinery Trades which took place last week. Among the many items mentioned at the meeting was the April Convention at Eastbourne, when although many guests and industrialists attended, a bigger attendance of members themselves was required. The annual dinner dance was fixed for November 13 at the Savoy Hotel.

Survey of Scientific Research in U.S.A.

THE British Commonwealth Scientific Office in Washington has just published for the first time its annual review of scientific activity in the U.S. This office is maintained to facilitate the exchange of scientific and technical information between the American Government and the British Commonwealth. It includes scientific missions from this country, Canada, Australia, N.Z., and S. Africa, and prepares an annual survey of American activities each year, but hitherto this has not been published. The publication is entitled "Science in U.S.A." Briefly, it deals with the rapid growth of research in the States during the past decade, research in universities, industrial research, co-ordination of work, conservation of materials, atomic energy and nuclear physics, water, and fuel and power resources. As regards the latter, it is estimated that the U.S. will consume by 1975 double the energy used in 1950.

New Showrooms

A NEW service centre has been opened by the London Electricity Board at Mitcham. It is at 1 Fair Green Parade, Upper Green West, and replaces a small centre occupied after the original showroom was bombed. The S.E. Electricity has taken premises in West Wickham (Kent) High Street, where it is proposed to open a service centre. The district is at present served by a mobile demonstration unit.

G.E.C. Sports and Gala

PERFECT weather favoured the annual championship sports and gala of the General Electric Co., Ltd., held at Preston Road, Wembley, last Saturday, when Head Office enjoyed a real field day, winning five of the seven championship events and being second in the other two. They also gained the Leslie Gamage trophy for securing the highest number of points. The Children's Corner was as popular as ever with many new and old attractions. After presentation of the prizes by Lady Railing, O.B.E., there was dancing in the evening to complete a very enjoyable function.

NEWS IN BRIEF

Westminster City Council is recommended to approve installations of flashing lights on beacons at 87 pedestrian crossings.

G.E.C. have been entrusted by Toronto Electric Commissioners with contract for 15 outdoor power transformers valued at £155,000.

Parents Day for college and school apprentices of Metrovick took place at Trafford Park works on June 27.

Leipzig Fair is to be held from August 30 to September 9.

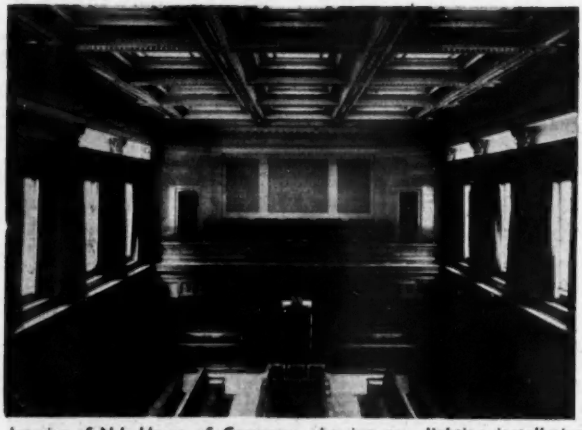
One of the first matters facing Glasgow Corporation after the summer recess will be the future of the city's 400 obsolete trams. Councillors will be asked to decide whether the trams should be replaced and if so whether by new trams, trolley buses or motor buses.

Enfield Cables Ltd.'s Wind Power Exhibition at Prae Wood, St. Albans, is to remain open until July 31.

New Lighting in N. Ireland Parliament

FOLLOWING the example set by Houses of Parliament in Westminster about two years ago, a new lighting installation has recently been carried out in the Northern Ireland House. One of the main considerations of lighting engineers of the Ministry of Finance and Siemens Electric Lamps and Supplies was, as at Westminster, to avoid spoiling original architectural features.

The House of Commons was fitted with 15 permanent laylights, into each of which was placed three Benjamin vitreous enamelled twin 5 ft fluorescent fittings operating on instant start circuits. Siemens daylight tubes were used and these can be switched on by the Speaker without any interruption to proceedings. This installation proved so successful that it was decided to carry out similar improvements in the Senate. The same technique was adopted excepting that the laylights housed two Benjamin 5 ft twin, and two 4 ft twin vitreous enamelled fittings, and warm white fluorescent lamps were supplied by Siemens. A floodlighting scheme for the exterior has also been installed for use on suitable occasions.



Interior of N.I. House of Commons, showing new lighting installation carried out by the Min. of Finance and Siemens Electric Lamps & Supplies

Questions in Parliament . . .

Severn Barrage

A decision as to the economic advisability of embarking on the Severn Barrage project had not yet been reached, the Minister of Fuel and Power told the House last week. He added that in the meantime research was continuing on unsolved technical problems and experiments were being made on models to determine effects. He was reminded by Mr. Renton that a similar answer was given to an almost identical question in 1946.

Flashing Beacons

The question as to whether flashing beacons installed at pedestrian crossings disturbed motorists or not, has been given prominence by objections of Westminster City Council. The Minister of Transport was asked about this matter last week, and in reply stated that it had been considered, but the flashing sign was distinctive and so far as he was aware no confusion had arisen.

Moriston H.-E. Project

Following the recent publication of the order and explanatory memorandum on the Moriston Hydro-Electric scheme, questions were asked last week, mainly by Mr. G. Nabarro, seeking details. The Secretary of State for Scotland said it was hoped to make a start on the scheme next year and to complete it in about four or five years. He said he had also been informed by the N. of Scotland H.-E. Board that the average load factor embodied in the revised project was 43½%. Installed capacity was 56 MW and the expected saving in coal (at conversion rate of 1·31 lb of coal per unit) would be about 125,000 tons of coal a year. Mr. J. Stuart went on to say he had been informed that the estimated capital cost per megawatt installed of the original scheme was £250,000, and that of the amended project was £232,000. If the cost of transmitting power to the grid was included, the estimated capital costs per MW installed of the two schemes were £260,000 and £242,000.

The Minister declined to give an immediate answer to another question regarding the advisability of electrifying railways to improve the use of capital in those costly projects.

Highland Railways

Mr. J. Stuart said he had nothing to add at this stage to his previous answer (reported in our June 25 issue) concerning Inverness County Council's resolution on the electrification of Highland Railways. He had not received that resolution.

Rural Electrification

Mr. J. Stuart told the House last week that the amounts of increased capital expenditure to be allocated to each of the Area Electricity Boards for rural schemes were still to be decided by the B.E.A. He had been asked about additional amounts to be given to Scotland in general and the S.E. Scotland Board in particular.

TV for Plymouth

Mr. D. Gammans told the House last week that the B.B.C. had not approved the site of the proposed low-power transmitter near Plymouth. A site at North Hessary Tor was favoured, but consultations were still proceeding.

Atomic Power

At present there was insufficient knowledge on which to base a precise assessment of the effect of nuclear energy on the fuel industries, the Minister of Fuel and Power told the House at question time last week. He added that the earliest application was likely to be in the generation of electricity, although the Government was alive to its application to industrial problems and that was being taken into account in the atomic energy programme.

Monopolies Commission Bill

The Monopolies and Restrictive Practices Commission Bill was presented to Parliament last week and read the first time on Wednesday. The Bill seeks to strengthen the Commission and enable them to deal with a greater number of references at one time. To facilitate this, three main changes are made. The chairmanship becomes a long-term pensionable appointment, and the B.o.T. can appoint up to two deputy-chairmen, on the same basis. Maximum membership of the Commission is increased from 10 to 25. Finally, the functions of the Commission will be exercisable by groups of not less than five members.

Coal Stocks

In a written answer on Friday, Mr. G. Lloyd stated that industrial and total distributed stocks of coal at the end of May were 3·7 and 13·9 m. tons respectively. Last year the comparative figures were 4·5 and 15·0 m. tons. He added that so far industry had taken more coal than last year, but consumption had also risen.

Television Development

Mr. H. Crookshank outlined the Government's plan to make television available to another six or seven million people. New stations are to be set up at Aberdeen, Belfast, the Isle of Wight, Plymouth and Pontop Pike. The London station will be removed to the Crystal Palace, and stations are also to be built to serve the Channel Islands and the Isle of Man. He added, with this programme of development television would be available to about 90% of the population in about 18 months. The remainder of Mr. Crookshank's lengthy statement dealt with the question of sponsored television.

Electric Supply News . . .

Belfast

During the visit of the Queen and the Duke of Edinburgh to Ulster last week, there was a failure of the electricity supplies to Belfast and the surrounding area on July 2. This breakdown, which lasted in some parts for about three hours, was caused by a major fault in the 33 kV busbars at Belfast's East power station. At a call from Mr. Mr. R. P. Watson, acting city electrical engineer and manager, switchgear specialists, with certain spare parts, were dispatched immediately by plane to Belfast.

Belper

The U.D.C. has expressed alarm at the provision of electricity to houses in its area by overhead cable, but the Consultative Council has decided not to refer the protest to the East Midlands Electricity Board. Instead, the matter is to be referred to the Derbyshire and Nottinghamshire local committee of the Consultative Council, for them to try to effect agreement. The U.D.C., which is erecting 300 houses at the Parks Estate, feel that the o.h. lines will detract from the amenities of the site.

Cirencester

The Urban and Rural District Councils are objecting to plans of the B.E.A. to erect a 275 kV line from Melksham to Birmingham by way of the Cirencester area. At a recent meeting at Gloucester, Mr. F. J. Lane, transmission engineer to the B.E.A., explained the need for the proposed line. Of a suggested alternative route via the Severn Valley, which, it was said, would be much less detrimental to the amenities, the Authority felt that the extra £200,000 involved (which figure might even reach £1 million), was not justified. After prolonged discussion, the chairman, Mr. J. W. W. Cripps, summed up the feeling of the meeting as being not satisfied that the B.E.A. had put forward any convincing case as to the unpracticability of the Severn Valley route. The question appeared to be—was the future amenity value of the Cotswolds worth the extra expenditure of perhaps £1 million on the scheme, he added. The matter was also discussed at a local meeting of the council for the Preservation of Rural England, when it was agreed to urge the County Executive Committee to continue to oppose the proposed plan.

Frome

When the question of providing a supply of electricity to the parishes of Woodlands and Blatchbridge was discussed at the recent Rural District Council meeting, it was stated that the cost of the scheme for the area was estimated at £7,200, and the anticipated annual revenue £500. It was decided to ask the Southern Electricity Board to canvass the local farmers to encourage them to participate more fully in the scheme.

N. Ireland

Plans have now been published for the construction of a run-of-the-river hydro-electric scheme on the Lower Bann, near Carnroe. Here a dam and sluice gates will be constructed entailing the flooding of about 600 acres of land bordering the river. The power station will have three 5,000 kW generators. The Northern Ireland Minister of Commerce has now given public notice of the scheme. We have already reported that the idea of utilising the Lower Bann was first suggested about 1923, and later, the Antrim Electricity Supply Co., Ltd., was given powers under the Electricity Supply Act, 1928, to erect a dam at Carnroe, to form a reservoir, but these works were not carried out.

Surrey

A proposal by the South Eastern Electricity Board to erect a 11 kV o.h. line across land between Godstone Road and The Chalet, Caterham, is being opposed by the Surrey Town and Country Planning Committee. Caterham and Warlingham U.D.C., has already objected to the proposal on the ground that it would be injurious to the visual amenities of the area.

Wakefield

Water returned to the River Calder from the B.E.A.'s new Wakefield power station now under construction must not raise the heat of the river to more than 90° F or to more than 20° F above the river temperature, whichever is the less. That is the condition applied by the Ministry of Housing and Local Government, following an appeal by the B.E.A. against the earlier stipulation by the Yorkshire Ouse River Board that the heat of the river should not rise to not more than 60° F or to 2° F above the river temperature when in excess of 60° F. The B.E.A. considered the latter unduly restrictive and applied to the Ministry of Housing and Local Government for a determination that the condition was unreasonable. The Minister gave his decision under Section 7 (10) of the Rivers (Prevention of Pollution) Act, 1951.

LIGHTING SCHEMES

Beckenham (Kent).—M.o.T. has authorised the Council to proceed with its scheme for new street lighting this year in Elmers End Road, Upper Elmers End Road, Links Way, South Eden Park Road, Beckenham Road and Crystal Palace Park Road. But the relighting of Wickham Road and Hayes Lane is to be postponed for another year.

Reigate.—A comprehensive scheme of street lighting for the whole borough, estimated to cost between £25,000 and £30,000, has been drawn up, the chairman of the Highways Committee has stated.

Warrington.—The R.D.C. is to submit to the M.o.T. for observation a street lighting scheme, estimated to cost £46,667, for Class "A" roads in the rural district, excluding part of Golborne Road.

Company Activities . . .

E. K. Cole Ltd.

Indicative of the continued expansion of this concern is the further increase in the trading profits, shown in the accompanying table. That

Year to Mar 31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	304,042	103,450	77	20	18/6	14/9
1951	514,740	169,050	142	25	21/3	13/10
1952	564,025	209,215	107	25*	17/7	13/6
1953	652,781	134,202	71	25†	18/3	14/3

* Plus 25% capital bonus † Plus 16⅔% capital bonus

the net profit for the year ended March 31 last is lower than that for the previous year is due entirely to the increased taxation demand. Current assets total £3,827,062, of which the value of stock and work in progress is listed at £1,782,929 —nearly £200,000 more than a year ago.

Hackbridge & Hewittic Electric Co. Ltd.

With a final Ordinary dividend of 15% the total distribution for the year to March 31 last is again 20%. The consolidated trading profit amounts to £460,853, compared with £466,959 for the previous year. After all charges, the net profit becomes £154,158 (*£158,546*).

Reason Manufacturing Co.

The net trading profit for the year ended January 31 last is £4,156, compared with £4,152 for the previous year. Since January the directors have declared an interim dividend of 1s. (*same*) per 5s. Ordinary share, and no further dividend is recommended for 1952-53.

Revo Electric Co. Ltd.

With a final dividend of 17½% the total distribution for the year ended March 31 last, is again 27½%. After charging taxation of £218,186 (*£240,541*) the consolidated net profit for the year is £171,590 compared with £170,542 for the previous year. Having obtained consent of the Treasury, it is proposed to issue as a free capital bonus 1,470,000 new 10s. Ordinary shares in the proportion of two new for every Ordinary share held. But the new shares will not be entitled to any dividend in respect of the year ended March 31 last. To give effect to this proposal, the authorised capital is to be raised to £1,250,000 by the creation of 1,500,000 additional Ordinary 10s. shares. The capital bonus will be provided by the capitalisation of £735,000 of reserves and profits.

Scottish Cables Ltd.

Trading profit for the year ended April 30 last increased to £465,862. The final Ordinary dividend is 12½%, making a total of 20%, but on capital increased by a one-for-one share bonus. For the previous year the total distribution was 32%. After charging taxation, depreciation, etc., the net profit is £176,341 compared with £124,900 for the previous year.

W. Mackie and Co.

The whole of the share and loan capital of this old established manufacturer of electric motors, generators, etc., has been acquired by W. and R. Wallace Industries, Ltd., who are roadstone and bituminous product makers and forage contractors. The purchase consideration is the issue of £100,000 5½% First Mortgage debenture stock, 1964-74. Mackie's are also to be provided with additional working capital.

Ward and Goldstone Ltd.

There is to be a final dividend of 30%, making a total of 45% for the year ended March 31 last. This is the same as for the previous year, but this time on capital which is increased by a 33⅓% script bonus. The profit too, at £506,427 is an increase of £85,731 on the previous year's total.

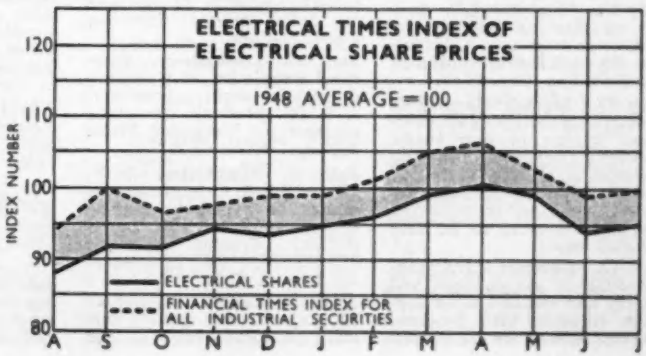
Dividends Declared

British Industrial Plastics.—Interim Ordinary dividend of 7½% payable on September 15. For the previous year a single payment of 12½% was made.

Drake and Gorham Ltd.—Dividend of 5% (*same*). The consolidated net profit for the year to March 31 last is £9,725 (*£21,346*).

International Combustion (Holdings).—Interim of 5% (*10%*).

After two months of gradual decline, both share price indices had recovered by the end of last month. The index for all industrial shares given by the "Financial Times" fell short of the 100 by only 0·27, actual figure being 99·83 compared with 99·1 at the end of May. "Electrical Times" index for all electrical shares rose from 94·7 to 95·11. Figures are based on average prices ruling in 1948



Commercial Information

CONTRACTS OPEN

HOME

July 10.—Kirkcaldy T.C. Supply and installation of 200 electric cookers and 200 washboilers. Burgh Engineer, Osborne House, East Fergus Place.

July 10.—N. Ireland. Electrical installation at Ulster College of Physical Education, Jordanstown. Documents from Ministry of Finance (Room 103), Law Courts Building, May Street, Belfast.

July 11.—Argyll. Electrical work in alterations to kitchen at County Sanatorium, Oban. Names by above date to C. G. Macechern, secretary, Bd. of Management, "Aros," Lochgilphead, Argyll.

July 11.—Longbenton U.D.C. Electrical installation in 180 houses at Burradon. A. E. Sweetman, Surveyor, Council Offices, Forest Hall, Newcastle-on-Tyne. Deposit £2 2s.

July 11.—Northumberland. Electrical installation and provision of lighting equipment for new stage at Alnwick C.M. school. Names by above date to County Architect, County Hall, Newcastle.

July 11.—Southport T.C. Installation of electric lighting and heating in 8 shops and 8 maisonnettes on Heathfield Rd. estate. Borough Architect, 91-105 Lord St. Deposit £1 1s.

July 13.—Blackpool T.C. Supply of flashing beacons for pedestrian crossings. A. Hamilton, Borough Surveyor, Municipal Buildings. Deposit £2.

July 13.—Bromley (Kent) T.C. Group A street lighting improvement scheme in four roads, involving re-erecting of existing columns and fixing 38 140 W sodium lanterns. Borough Engineer, Municipal Offices, Bromley, Kent. Deposit £2 2s. (See June 25 issue.)

July 13.—Cheshunt U.D.C. Dismantling of gas columns and supply and erection of 44 concrete columns with brackets, lanterns suitable for 250 W mercury lamps, and auxiliary gear, for street lighting in College Rd. Engineer and Surveyor, Manor House. Deposit £2.

July 13.—Chester T.C. Wiring of Christ Church and Boughton St. Pauls schools, and rewiring of City high school. City Engineer and Surveyor, Municipal Offices. (See June 25 issue.)

July 13.—Wallasey T.C. Electrical installation at Leasowe secondary and the Birket primary schools. Borough Architect Town Hall. Deposit £1 1s. (See June 18 issue.)

July 13.—West Riding. Improvement to existing electrical installation at Todmorden Roomfield secondary school. Also renewal of electrical installation at Thorne Moorends boys' primary school and part renewal of same at Thorne Moorends girls' secondary school. County Architect, Bishopsgate, Westfield Rd., Wakefield. Deposit for second contract £2 2s. (See June 25 issue.)

July 13.—Wigan T.C. Wiring installation in 100 dwellings on Worsley Mesnes estate. Borough Engineer, Municipal Buildings, Hewlett St. Deposit £1 1s.

July 16.—Chertsey U.D.C. Installation of mercury lighting scheme to Group A standard along about 1,900 yd of Woodham Lane. Engineer and Surveyor, Council Offices, Guildford St. Deposit £1 1s.

July 16.—Newbiggin U.D.C. Electrical work in 30 dwellings on Spital estate. Surveyor, Council Offices.

July 17.—Londonderry. Electrical installation at Ballykelly primary school extension. J. R. W. Murland, consulting engineer, 13 Wellington Place, Belfast. Deposit £2 2s.

July 17.—Manchester. N.W. Div. of B.E.A. invite tenders for repairs to hyperbolic cooling towers at Stuart St. power station. Divisional Secretary, 825 Wilmslow Rd., Manchester 20. Deposit £2 2s.

July 18.—Lanark. Supply of 22 lanterns, leak transformers and capacitors for 140 W sodium lighting along Lanark-Airdri-trunk road. Apply by above date to County Lighting Engineer, 15 Clydesdale Street, Hamilton.

July 18.—Prestwich T.C. Supply of equipment for conversion from tungsten filament to sodium vapour lighting along Heywood Rd. Borough Engineer, Town Hall.

July 18.—Whitefield (Lancs) U.D.C. Supply and erection of 73 Group A concrete columns with sodium lamps, lanterns and all auxiliaries, as well as dismantling existing equipment, along Manchester-Burnley (A.56) trunk road. Engineer and Surveyor, Town Hall. Deposit £2 2s.

July 20.—Barrowford (Lancs) U.D.C. Electrical work in erection of 18 houses on Higher Causeway estate. Engineer and Surveyor, Council Offices. Deposit £1 1s.

July 20.—Dover T.C. Supply and erection of 66 concrete columns and fixing only of H.P.M.V. units and auxiliary equipment, and complete wiring for Group A standard street lighting installation along Folkestone Rd. Borough Engineer, Brook House. Deposit £2 2s. (See July 2 issue.)

July 20.—Dundee T.C. Supply of poles, brackets and lanterns for Group B street lighting, and a battery for Morrison electric tower wagon. Public Lighting Engineer, 46 Dens Rd.

July 20.—Leigh T.C. Installation of (a) 46 Class A mercury-vapour lighting points on 25 ft. concrete columns, and (b) 25 Class A mercury and five fluorescent tube lighting points on 25 ft. concrete columns. Borough Engineer and Surveyor, Town Hall.

July 20.—Southport T.C. Alteration and additions to electrical installation and lift at Fairholme, 8 Oxford Rd., Birkdale. Borough Architect, 93-105 Lord St. Deposit £1 1s.

July 21.—Bingley (Yorks) U.D.C. Rewiring of Town Hall. J. S. Laltin, Surveyor and Architect, Town Hall. Deposit £1 1s.

July 21.—Dublin. Electrical heating in Valuation Office, Ely Place. J. Tyrrell, secretary, Office of Public Works. Deposit £1.

July 21.—Southend T.C. Lighting and power installation in Leigh primary school. Borough Architect, 30 Alexandra St.

Deposit £2. (Advertised in this issue.)

July 21.—Waterford. Supply and erection of pumps and electric motors suitable for 380 V, 3-phase a.c. supply for Tramore water supply scheme. Engineer, Council's Offices, Davitt's Quay, Dungarvan. Deposit £1 1s.

July 22.—Co. Tyrone. Electrical installation at Denamona primary school, Fintona. Chief Education Officer, Educ. Offices, Omagh. Deposit £3 3s.

July 23.—Durham T.C. Supply and erection of 34 250 W mercury street lights along Sutton St. and Crossgate St. City Engineer, Town Hall. (See July 2 issue.)

July 24.—Dublin. Electric lighting, heating and other services at New Post Office, Monaghan. J. W. O'Neill, Engineer-in-Chief, Dept. of Posts and Telegraphs, The Castle.

July 24.—Heston and Isleworth T.C. Installation of Group A street lighting, including dismantling, erection of columns, lanterns and steel columns, and 400 W mercury lamps, along London-Bristol trunk road. Borough Engineer and Surveyor, 88 Lampton Rd., Hounslow. Deposit £2 2s. (Advertised in this issue.)

July 24.—Lyme Regis T.C. Supply and erection of concrete columns, wall brackets and necessary fittings for improved street lighting scheme. Borough Surveyor, Borough Offices. Deposit £1 1s. (Advertised in this issue.)

July 27.—Southwick U.D.C. Supply and erection of 27 sodium street lamps, 28 conversions from tungsten and sodium, and 74 tungsten lamps. Engineer and Surveyor, Town Hall. Deposit £2 2s.

July 27.—West Riding. Renewal of electrical installation at Dearne Thurnscoe The Hill secondary school. County Architect, Bishopgarth, Westfield Rd., Wakefield. Deposit £2 2s.

July 28.—Dundalk. Electrical installation at Fever Hospital. J. C. Costelloe, Consulting Engineer, 21 Lesson Park, Dublin. Deposit £10 10s.

July 29.—Ely (Camb) R.D.C. Electrical equipment for 6 bungalows in The Hithe, 29 houses in Woodfen Drove, and 6 bungalows in Victoria St. (all at Littleport), and 43 dwellings at Sutton and 6 houses at Thetford. Engineer and Surveyor, Council Offices, 11 Lynn Rd.

July 30.—East Riding. Installation of electricity at Leconfield primary school. County Architect, County Hall, Beverley.

July 31.—Belfast. Supply, erection, etc., of two 48-in bore motor-operated sluice valves, six motor-operated penstocks and other associated equipment at Belfast Municipal Power Station West. Tender form (No. N.1389) from Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (See July 2 issue.)

July 31.—Midlothian. Supply and erection of 77 concrete columns and installation of 80 W mercury lamps, etc., for Group B lighting at Newbattle New Community scheme. County Surveyor, 32 Palmeston Place, Edinburgh.

Aug. 1.—Ross and Cromarty. Installation of electric lighting and power in 22 houses on Isle of Lewis. Applications by above date to P. S. Leake, County Architect, The Old Academy, Dingwall.

Aug. 3.—Manchester T.C. Electrical installation at "Lawnhurst" in Wilmslow Rd. City Architect, Town Hall. Deposit £1 1s. (Advertised in this issue.)

Aug. 6.—Belfast. Lighting installation in Currie jun. primary school extensions in Cosgrave St. Education Architect's Dept., Academy St.

Aug. 19. — Newcastle-on-Tyne. Lighting, power and impulse clock installations at Stocksfield Ave. school. R. W. Gregory and Partners, consulting engineers, Pilgrim House. Deposit £5 5s.

Aug. 31. — Thurrock U.D.C. Manufacture and installation of 3 axial-flow pumps, electrically driven and complete with switchgear, starters, travelling overhead crane, etc. for Marsh Farm Sewage works. W. H. Radford and Son, consulting engineers, Albion Chambers, King St., Nottingham.

No date stated.—Newcastle-on-Tyne. Supply of one 10-ton and three 6-ton electric travelling cranes for Newcastle Quay. Particulars from City Engineer, Town Hall.

No date stated.—N. of Scotland H.-E. Board. Lighting, heating and auxiliary cabling installation at Errochty Dam intake and compensation turbine house. Merz and McLellan, 72a George St., Edinburgh. Deposit £2 2s.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horseguards Avenue, S.W.1, quoting reference.*

July 27.—India. Govt. of Travancore-Cochin require supply of total of 49,000 yd of PILC double steel tape armoured and jute served underground cable. (Tender No. 21). Secretary,

Your Queries — Answered

Self-contained electric wringers, makers of? L.E.B.—Acme Wringers Ltd., 85 David St., Glasgow. (23147)

British Electric Meters Ltd., address of? T.E.—This is now Denis Ferranti Meters Ltd., Bangor, North Wales. (23156)

"Duraplug" rubber plugs, makers of? J.L.—W. W. Haffenden Ltd., Richborough Rubber Works, Sandwich. (23169)

"Crown Merton" aluminium ware, makers of? E.B.—Corfield-Sigg Ltd., Station Road, Merton Abbey, S.W.19 (23175)

Senior Lighting Co. Ltd. address of? S.E.—This is now Tide Electrical Co. Ltd., 34/36 High Street, Southall, Middx. (23182)

"Maddox" coffee percolators, makers of? R.B.—H.M.V. Household Appliances, Hayes, Middx. (23189)

"Pearl" kettles, makers of? S.W.—Pearl Industries Ltd., Birmingham Factory Centre, Kings Norton, Birmingham. (23196)

The above are selected from questions we have answered this week. If you have a query, send it to us.

Stores Purchase Committee, Trivandrum. B.o.T. (Ref.: CRE 21982/53)*.

Aug. 3.—India. Tenders invited for supply of (a) approx. 57 step-up and step-down power transformers from 5,000 kVA to 75 kVA and (b) about 155 11 kV indoor type switchgear, for the Electricity Dept., Govt. of Uttar Pradesh. Documents at Rs. 25 per set available from Project Officer, Hydel (Ganga) Circle, Electricity Dept., U.P., Roorkee.

Aug. 6.—Uruguay. Supply of total of about 8,500 lamps and 300 fluorescent tubes suitable for a.c. of 240 V and 50 c/s. Administracion Nacional De Combustibles Alcohol y Portland, Montevideo. B.o.T. (Ref.: CRE 21336/53)*.

Aug. 26.—Australia. State Elect. Commission of Queensland invites tenders for supply of engine driven electrical generating plant for Barcaldine Shire Council under Spec. No. 350. Commission is at Scottish Union Hse., Eagle St., Brisbane. B.o.T. (Ref.: CRE 20904/53)*.

Aug. 31.—India. Supply of sundry equipment for fluorescent street lighting required by Stores Purchase Committee, Govt. of Mysore. B.o.T. (Ref.: CRE 21889/53)*.

Sept. 5.—Tangier. Supply of electrical equipment for three indoor transformer stations (5,500 V), namely Venezuela, Andalousie and Castelar. Tangier Water and Electricity Board, 4 Rue Vermeer, Tangier. B.o.T. (Ref.: CRE 22013/53)*.

Sept. 9.—Australia. Supply, erection, etc., of six boilers to be installed at three different power stations of Wide Bay-Burnett, Capricornia, Townsville Boards. Specifications (£2 2s.) from Secretary, State Electricity Commission of Queensland. B.o.T. (Ref.: CRE 21765/53)*.

Sept. 22.—New Zealand. Supply of seven single-phase potential transformers, each 63,500/63·5 V, 500 VA, class B accuracy. 50 c/s, outdoor type and oil immersed for State Hydro-Electric Dept., Wellington. Contract No. 233. B.o.T. (Ref.: CRE 22262/53)*.

Sept. 24.—Australia. Manufacture, supply, testing, etc. (under Spec. No. 1763) of 150 MVA indoor cubicle type oil circuit-breakers for 11 kV or 5 kV service. Manager, Sydney County Council, Queen Victoria Building, George St., Sydney. B.o.T. (Ref.: CRE 22633/53).*

PRICE OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	252 0 0	—
LEAD, good soft pig (foreign)	89½-9)	108 0 0
TIN (99·95% 6%) (Cash)	605-610	—
(3 months)	617½-610	—
ALUMINIUM, commercial purity (del.)	150 0 0	—
ZINC	71½-71½	88 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.)	50 10 0	—
Mild Steel Tape (0·04 in.)	40 0 0	—

CONTRACTS PLACED

B.E.A. One 30,000 kW turbo-generator, feed water heating, condensing plants and auxiliary apparatus at Acton Lane B, Richardsons, Westgarth and Co., Ltd.; Generator and unit transformers at Brunswick Wharf, Poplar, Metropolitan-Vickers Electrical Co., Ltd.; One 250,000 lb/hr boiler and ancillary equipment at Deptford East, Foster Wheeler, Ltd., One 52,500 kW turbo-generator and auxiliary apparatus at same, Metropolitan-Vickers Electrical Co., Ltd., and Condensing and feed heating plant for one 52,500 kW turbo-generator set at same, Vickers-Armstrongs, Ltd.; One 60,000 kW turbo-generator set and condensing and feed heating plants at Brighton B, Richardsons, Westgarth (Hartlepool), Ltd.; Five 60,000 kW turbo-generators at Marchwood, English Electric Co., Ltd.; One 60,000 kW turbo-generator, condensing and feed heating plant and generator and unit transformers at Portishead B, Metropolitan-Vickers Electrical Co., Ltd.; One 60,000 kW turbo-generator at Ince, General Electric Co., Ltd. and Condensing and feed heating plant for one 60,000 kW turbo-generator at same, Hick, Hargreaves and Co., Ltd.; Cooling tower at Thornhill, J. L. Kier and Co., Ltd.; Two 30,000 kW turbo-generators at Barony, General Electric Co., Ltd., and Condensing and feed heating plant for two 30,000 kW turbo-generators at same, Hick, Hargreaves and Co., Ltd.; and 132 kV 3,500 MVA switchgear at Castle Donington, British Thomson-Houston Co., Ltd.

Derby T.C. Electrical installation in 10 houses on Mackworth estate, A. J. Dyer and Sons, Ltd., £2,356.

Newcastle-on-Tyne T.C. Electrical installation in stage 2 of Rutherford College of Technology, Robson and Coleman, Ltd., £19,470.

TRADE NOTES

Change of Address. Marbourn Ltd. are now at Roslyn Works, Roslyn Rd., South Tottenham, N.15. Telephone: Stamford Hill 0988.

Holidays. The Luton works of the Jackson Electric Stove Co. will be closed from July 18 to August 4.

N.Z. Imports. The New Zealand import control authorities have announced that, although no allocation is at present provided for electric irons (excluding travelling irons, electric steam irons, and no-cord irons), applications will be considered for licences to import those of a kind not made in New Zealand. Previously, licences could be granted only in exceptional circumstances.

Brazil. The Commercial Secretary, in Rio de Janeiro, has stated that licences may now be issued for the import into Brazil of suspension-type isolators for use with transmission lines exceeding 220 kV.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Conycote. 716,337. Class 9. Electric cables and insulated wires. Connollys (Blackley) Ltd., Blackley Vale Mills, Blackley, Manchester.

Crusilite. 714,632. Class 9, and 714,633. Class 11. Electrical heating elements. Morgan Crucible Co., Battersea Church Rd., S.W.11.

Gad-about. 716,498. Class 8. Hand tools. Elga Products Ltd., Elga House, Railway Place, S.W.19.

Microline. 706,098. Class 9. Electrical h.f. apparatus consisting of concentric or coaxial transmission lines; apparatus for testing and measuring h.f. equipment and phenomena, etc. The Sperry Corporation, Lakeville Rd., Great Neck, Long Island, New York.

BUSINESS PROSPECTS

HOME

Ashington R.D.C. Erection of 80 houses in Darnley Rd. J. Kent, Clerk to Council, Council Offices.

Barnsley. W. T. Turner, Westbourne Grove, is architect for shop and office premises for R. Whitehead, 55 Huddersfield Rd.

Birkenhead T.C. Construction of 217 houses on Woodchurch estate. Borough Architect, "Marlo," Wexford Rd.

Bolton T.C. Approval sought for 214 houses and 18 bungalows off Red Lane, and 50 dwellings in Adrian estate.

Bournemouth. Approval sought for erection of pathological laboratory at Royal Victoria Hospital. Estimated cost, £27,000.

Bridge Blean (Kent) R.D.C. Erection of 34 houses at Sturry, nr. Canterbury.

Bridgwater (Som.) T.C. Plans approved for erection of about 200 houses on various sites. J. D. Blacklock is borough architect.

Chester-le-Street. It is proposed to convert ballroom into cinema at Church St., Sacriston, for A. and F. Entertainments Ltd. Architect is J. F. Ashworth, Blackhill, Co. Durham.

Consett U.D.C. Erection of shops on Richard Murray estate. Architect is J. J. Eltringham, Derwent St., Blackhill.

Darlington T.C. First stage of proposed new College of Further Education to cost £63,750 is to be included in next year's programme.

Exeter. Plans approved for erection of welfare centre at Honeylands. Also it is proposed to erect 400 houses during 1954 in one project, to develop land in Sweetbriar Lane area, and build 26 houses in Exwick Rd.

Gosport (Hants) T.C. Plans prepared for erection of school in Wych Lane. Also, tenders may soon be invited for building 16 flats and 67 houses on Woodcot estate.

Grantham (Lincs) T.C. Construction of 48 houses. Borough Engineer and Surveyor, Guildhall.

Hemel Hempstead T.C. Construction of 58 houses on site at Werners End. A. H. Turner, Borough and Water Engineer, Market Square.

Harwich T.C. Erection of 18 dwellings on Pound Farm estate and 12 in Harbour Crescent. Borough Architect, Town Hall.

Horsham (Sus.) R.D.C. Construction of 32 houses at Broadbridge Heath. Godman and Kay, architects, Milnwood, 13 North Parade.

Huyton (Lancs). North-Western Industrial Estates, Ltd., Liverpool, are to build factory in district for Huntley and Palmers Ltd. Quantity Surveyors are E. C. Harris and Partners, 3 Bedford Sq., W.C.1.

Leicester T.C. Fifty-two houses and 4 flats to be built on Braunstone estate.

Limavady U.D.C. Layout plans approved for erection of 56 houses and 64 flats off Irish Green St. for N. Ireland Housing Trust.

Lincoln. County Council to erect new sub-divisional police H.Q. and six houses at Bracebridge Heath.

Linlithgow T.C. Fifty houses to be built at Braehead for Scottish Special Housing Association.

Liverpool. Erection of 756 dwellings in Deysbrook Lane, and 12 flats in Anfield Rd., City Architect and Director of Housing, Blackburn Chambers, Dale Street.

Llandyssul (Card). Erection of new public hall in district. D. E. Evans, hon. sec., Public Hall Trustees, 1 Marble Terrace.

Llwchwr U.D.C. Erection of 114 dwellings at Gorseinon. Architect, T. Bryn Richard, Council Offices, Gorseinon.

Middlesbrough T.C. It is proposed to erect 11 shops and houses at Berwick Hills. J. A. Kenyon, Borough Engineer, Municipal Buildings.

Newcastle-on-Tyne. Consideration being given to erection of new shopping centre from St. Mary's Place to New Bridge Street.

Newcastle-on-Tyne T.C. Construction of Stocksfield Ave. primary school in Benwell Hill Rd. H. V. Lightfoot, director of education, City Education Office, Northumberland Road.

Norfolk. School building programme for 1954-5 includes secondary modern at Downham Market and Diss, and another at Aylsham. Costs estimated at £85,350, £74,600 and £139,250 resp.

Northants. Following have been included in next year's building programme: secondary school (£141,000) and infants' school (£40,750) at Corby, second instalment of secondary technical school (£82,000) at Wellingborough, and secondary school (£100,000) at Roade.

North Shields. Houseman and Thompson Ltd., Jesmond Rd., Newcastle-on-Tyne, are considering erection of factory in Howdon Road.

Plymouth T.C. Construction of 48 flats in Notte St. H. J. W. Stirling, City Architect, Seymour Road.

Rawtenstall T.C. Erection of 20, 73, and 39 houses in three contracts. R. H. Snowball, Borough Engineer and Surveyor, Town Hall.

Sheffield. Mecca, Ltd., of London, are to convert the disused Lansdowne cinema in London Rd. into a dance hall. Also building programme for 1954-55 has been approved—it includes infants and junior school at Bredway, £89,936, King Egbert secondary technical school, £205,000; and Newfield secondary school, £187,000.

Sunderland. T.C. is being urged to build 586 houses to north of town and 1,272 houses to the south. Also approval has been given to plans for 1,259 houses proposed at Grindon village. Borough Architect, H. C. Bishop Grange House, Stockton Rd.

Wellingborough U.D.C. Erection of 112 houses on Croyland Hall Farm estate. R. Kilby, Engineer and Surveyor, Council Offices.

OVERSEAS

Austria. Karner, Wochinger and Co. Ltd., 14-16 Porzellangasse, Vienna IX/66, wish to obtain agencies for U.K. manufacturers of insulating material, recording tapes, electrical sheets and tungsten welding electrodes. Write direct.

Italy. The firm of "Ave" (Fabbrica Materiale Eletrico ed Articoli Stampati in Resine Sintetiche) of Vestone wish to obtain representation of British manufacturers of domestic electrical appliances and equipment.

U.S.A. U.K. source of supply of electric motors up to 200 h.p., transformers between 1 and 100 kW, manual and automatic electric motor controls and electric hand tools, is being sought by Albert S. Knight Co., 3010 Western Ave., Seattle 1, Washington. Articles should be suitable for 115-120 V 60 c/s a.c. or a.c./d.c. supply.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Allied International Co., Ltd. Exporters, importers, distributors, manufacturers representatives and agents for goods of all kinds, including electrical, electronic, aeronautical, marine, air conditioning, heating and cooling, mechanical, industrial, transport and processing plant, etc. Cap.: £1,000. Dirs.: C. B. H. Fentiman, 40 The Highways, Sutton, Surrey; and D. H. McBean, 51 Tamworth Park, Mitcham, Surrey.

Bates and Bates Ltd. Mechanical, electrical or electronic engineers, etc. Cap.: £100. Dirs.: C. R. Bates, 73 Ashville Av., Castle Bromwich; R. C. Ashworth, c/o C. W. Branch, Admiralty, S.W.; F. A. Carr.

Brouralay Tools Ltd., 43 Devonshire Place, Brighton, 1. Mechanical, electrical and general engineers, precision engineers, etc. Cap.: £1,000. Dirs.: R. L. Oura and J. Layfield.

Burridge and Mathison Ltd. Electrical engineers and contractors, wireless, mechanical and general engineers, etc. Cap.: £5,000. Dirs.: J. A. S. Burridge, 81 Sherringham Av., Tottenham, N.17; and K. Mathison, 114 Eastfield Rd., Waltham Cross.

Constellar Lighting Ltd., 49 Hollywood Rd., Kensington, S.W.5. Manufacturers of and dealers in electric signs, advertising appliances, etc. Cap.: £1,000. Dirs.: to be appointed by subs. Subs.: B. G. M. Mitchell and F. A. Ross.

W. S. Chrysaline (Holdings) Ltd., 10 Adam St., Adelphi, W.C.2. To acquire and hold shares or stock of W. S. Chrysaline, Ltd., or any other company or companies with similar objects; to manufacture and deal in advertising signs, theatrical properties, display signs, road and traffic signs; models and prototype models, sprayers of goods and materials with protective covering, etc. Cap.: £50,000. Dirs.: R. L. Warren-Smith, B. P. Pick, N. Bezzant and C. L. Ross.

Franklin and Freeman (Essex) Ltd. Electrical, radio, radar, television, electronic, mechanical and optical engineers, etc. Cap.: £100. Dirs.: A. Newman, 19 Rochester Gdns., Ilford; N. W. Newman, 209 Main Rd., Gidea Park and S. S. Newman.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

County Electronics Ltd. Meeting of creditors will take place at Town Hall, Kendall, tomorrow (Friday) at 3 p.m.

George Dann Ltd. Resolution for voluntary winding-up passed at meeting on June 16. Creditors subsequently appointed J. S. Bradley-Hole, cert. acc., of A. E. Orbell and Co., 7 Old Steine, Brighton, as liquidator.

Voluntary Liquidations

Buchanan Dunlop and Co., Ltd. At statutory meeting of creditors statement of affairs presented showed liabilities of £6,260, of which £4,402 was due to trade creditors; £1,055 loans; £241 to Bank; and £561 in respect of preferential claims. Assets of a book value of £2,053 were estimated to produce £305, leaving a deficiency of £5,955 as regards creditors. Issued capital was £100 and, so far as shareholders were concerned, there was total deficiency of £6,055. Resolution passed confirming voluntary liquidation with F.W. Inns, acc., of 289 High Holborn, London, W.C.1, as liquidator, with a committee of inspection.

G. E. Collinge and Co., Ltd. At meeting of creditors statement of affairs showed liabilities of £2,091, of which £1,133 was due to trade and expense creditors; £77 to Bank; and £879 loans by directors. Assets estimated at £317 and after allowing £91 for preferential claims there were net assets of £226, or deficiency of £1,864. Shareholders had met previously and passed resolutions for voluntary liquidation with A. Rothburn, acc., of 7 Brazennose Street, Manchester, as liquidator. No resolution was passed at the creditors' meeting.

Pier Electrical (Brighton) Ltd. At meeting of creditors a resolution passed confirming voluntary liquidation with J. S. Bradley-Hole, acc., of A. E. Orbell and Co., 7 Old Steine, Brighton, as liquidator, with committee of inspection. According to approximate statement of affairs liabilities totalled £987, of which £325 was due to trade and expense creditors and £662 in respect of directors' claims. Assets were shown at £505 and after allowing £10 for preferential claims there were net assets of £495, or deficiency as regards creditors of £492. Issued share capital was £300 and, so far as the shareholders were concerned, there was a total deficiency of £792.

Ward and Co. (Dewsbury) Ltd. Liabilities of £7,391 were shown in statement of affairs submitted to statutory meeting of creditors. Assets were estimated to produce £3,582 and after allowing £1,222 due to secured and preferential creditors there were net assets of £2,360, or deficiency of £5,030. Creditors passed resolution confirming voluntary liquidation with C. Sykes, acc., of 11 Bond St., Dewsbury, as liquidator, with a committee of inspection.

BANKRUPTCY ACTS

Receiving Orders

Blackburn. Frank Lockett, electrician of 10 Blackburn Rd., Gt. Harwood. Receiving order dated June 30.

King's Lynn. Roy B. Goetze, electrical contractor trading at Old Market, Wisbech. Date of receiving order, June 29.

Intended Dividend

Wigan. Margaret J. Ruddick, trading as J. Ruddick, dealer in electrical appliances at 89 Park Rd., Wigan. Last day for receiving proofs, July 17. Trustee is A. K. Ferguson, Official Receiver, West Africa House, 25 Water St., Liverpool 2.

Dividend

Bournemouth. Edward J. R. Tremlett, radio and electrical dealer of 941 Wimborne Rd., Moordown, Bournemouth. First and final dividends of 4s. 11½d. in £ payable at Midland Assurance Buildings, Fir Vale Rd., Bournemouth, on July 18.

MEETINGS TO NOTE

TUESDAY, SEPT. 15

A.P.L.E. Annual Conference and Exhibition at Liverpool continues until Sept. 18.

THURSDAY, SEPT. 24

I.E.E. Section summer visit to Porthcawl, Sept. 24 to 27.

EXHIBITION DIARY

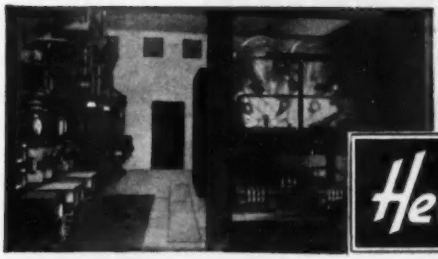
Brit. Instrument Industries Show opened at Olympia on June 30 and closes on July 11.

Royal Show. Being held this year at Stanley Park, Blackpool, from July 7 to 10.

Gt. Yorkshire Agric. Show. Opens at Harrogate on July 14.

Royal Welsh Agric. Show. Will be held at Cardiff between July 22 and 25.

Complete RECTIFIER SUBSTATION EQUIPMENTS comprising

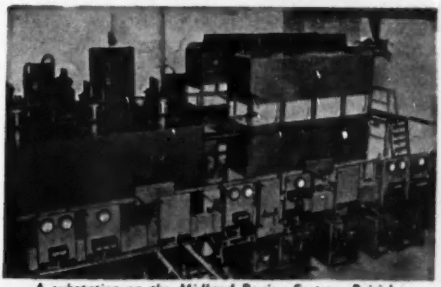


Hewittic Rectifiers

REGD. TRADE MARK

Hewittic equipped rectifier substation 1,000 kw4 supplying Reading Corporation trolley buses.

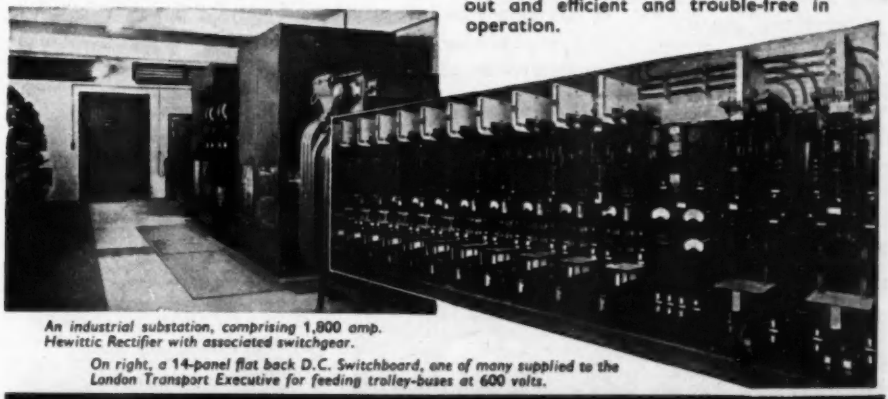
and associated switchgear



A substation on the Midland Region System, British Railways, showing in the foreground, H.V. switchgear, and, in the background, Hewittic rectifier and high speed D.C. switchgear.

Hackbridge and Hewittic Electric Co., Ltd., has been responsible for the supply of complete equipment for a very large number of rectifier substations, including in each case not only the Hewittic Rectifier—simplest, most reliable of all converting plant—but also the whole of the H.V. and L.V. switchgear.

The Company will gladly offer its advice and quotation for complete equipment, with the assurance—from long experience—of a thoroughly satisfactory installation, modern in layout and efficient and trouble-free in operation.



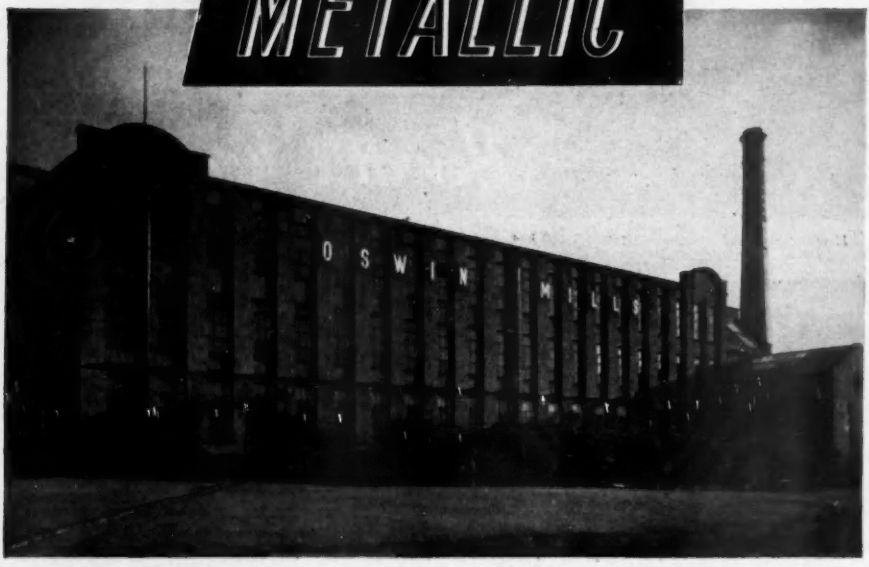
An industrial substation, comprising 1,800 amp. Hewittic Rectifier with associated switchgear.

On right, a 14-panel flat back D.C. Switchboard, one of many supplied to the London Transport Executive for feeding trolley-buses at 600 volts.

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES · SURREY · ENGLAND
Telephone: Walton-on-Thames 760 (8 lines) Telegrams: "Electric, Walton-on-Thames"

CONDUIT & FITTINGS SUPPLIED BY

METALLIC



Oswin Mills, Frizinghall Bradford *Photo by courtesy of Samuel Rushworth, Ltd.*

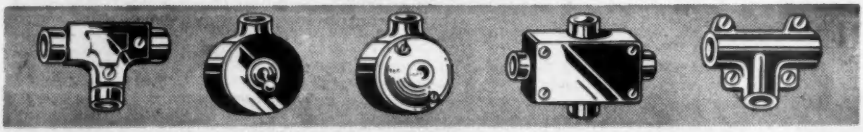
A TI COMPANY

It may be a school, it may be a factory—a power station or a housing estate, but more often than not the electrical specification will be—METALLIC.

This Yorkshire mill is no exception, being fitted throughout with METALLIC conduit and fittings—unequalled for quality and consistent accuracy.

THE METALLIC SEAMLESS TUBE CO. LTD.

LUDGATE HILL • BIRMINGHAM • 3



ALSO AT LONDON • NEWCASTLE-ON-TYNE • LEEDS • SWANSEA & GLASGOW

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

PUBLIC NOTICES

E.I.B.A. ANNUAL MEETING

THE ANNUAL General Meeting of the Electrical Industries Benevolent Association will be held on Wednesday, July 22, 1953, at 11 a.m. at the Institution of Electrical Engineers, Savoy Place, London, W.C.2. (E 313)

TENDERS INVITED

BOROUGH OF HESTON AND ISLEWORTH

London-Bristol Trunk Road, A.4.
Bath Road, Cranford

STREET LIGHTING IMPROVEMENT

THE BOROUGH COUNCIL invite Tenders for the installation of new street lighting to Group "A" Standard along a section of the Bath Road, Cranford, for a distance of approximately one mile.

The works include:—

(a) Taking down of existing columns and lanterns.
(b) Supply and erection of new steel columns.
(c) Supply and erection of lanterns with 400 W Mercury Vapour Discharge Lamps.

Specification, bill of quantities and form of tender can be obtained from, and the drawings and conditions of contract inspected at, the office of the Borough Engineer and Surveyor, 88 Lampton Road, Hounslow, on payment of a deposit of two guineas, which will be refunded on receipt of a bona-fide tender not subsequently withdrawn.

Tenders, enclosed in plain sealed envelopes endorsed "Bath Road Street Lighting," but bearing no indication of the name or address of the sender, must be delivered to the undersigned not later than 10 a.m. on Friday, July 24, 1953.

The Council do not bind themselves to accept the lowest or any tender.

HAROLD SWANN,
Town Clerk.

Council House, Hounslow. (E 285)

BOROUGH OF DOVER

TRUNK ROAD LIGHTING

Folkestone Road, A259

TENDERS are invited for the supply and delivery of 66 sets of lanterns, with 400-watt H.P.M.V. lamps, gear, time-switches, etc., all to Group "A" lighting standard.

Specification and form of tender may be obtained from the Borough Engineer, Brook House, Dover, upon payment of a deposit of two guineas, returnable on receipt of a bona-fide tender not subsequently withdrawn.

Plans and general conditions of contract may be seen at the office of the Borough Engineer.

Sealed tenders, in the envelopes provided, must be delivered to the undersigned not later than July 20, 1953.

JAMES A. JOHNSON,
Town Clerk.

New Bridge House,
Dover.
July 4, 1953. (E 332)

CITY OF MANCHESTER

THE Welfare Services Committee invite tenders for the electrical installation required at "Lawnhurst," Willmslow Road, Manchester.

Specification, drawings and tender form may be obtained from the City Architect, Town Hall. Deposit £1 1s. (returnable). Tenders, sealed in endorsed envelopes, must be delivered by 10 a.m., Monday, August 3, 1953.

PHILIP B. DINGLE,
Town Clerk.

July, 1953. (E 331)

COUNTY BOROUGH OF SOUTHEND-ON-SEA

ELECTRICAL INSTALLATION

TENDERS are invited for the New Electric Lighting and Power Installation at Leigh Primary School, North Street, Leigh-on-Sea.

General Conditions may be inspected and copies of Plans, Form of Tender, and Specification obtained on and after Monday, July 6, 1953, on application to the Borough Architect, 30 Alexandra Street, on payment of a deposit of £2, which will be refunded on receipt of a bona fide tender or the return of all loaned documents.

Sealed tenders addressed to the undersigned and endorsed "Electrical Installation—Leigh Primary School" are to be delivered to this office before 12 noon on Tuesday, July 21, 1953.

No tender will be received except in the special envelope provided, which shall not bear any name or mark indicating the sender.

The Corporation do not bind themselves to accept the lowest or any tender.

ARCHIBALD GLEN,
Town Clerk.
(E 295)

BOROUGH OF LYME REGIS

STREET LIGHTING—IMPROVED SCHEME

TENDERS are invited for the carrying out of works for the improvement of street lighting; i.e. the supply and erection of new 15-ft. and 25-ft. concrete standards and wall brackets with necessary fittings.

Specifications and Tender forms may be obtained on application to the Borough Surveyor, Borough Offices, Lyme Regis, on payment of a deposit of £1 1s.

The Plan showing the positions of new standards, etc., and alterations to existing standards may be inspected at the office of the Borough Surveyor.

Tenders in plain sealed envelopes endorsed "Street Lighting Scheme" should be delivered to me, the undersigned, not later than 12 o'clock noon on Friday, July 24, 1953.

The Council does not bind itself to accept the lowest or any tender.

GILBERT ATTERBURY,
Town Clerk.

Town Clerk's Office,
Lyme Regis.
June 30, 1953. (E 294)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

SOUTH WALES ELECTRICITY BOARD

REQUIRED, THIRD ASSISTANT in commercial department at the Western Sub-Area of the Board at Tenby.

Successful candidate will be required to assist in rural development, d.c./a.c./changeover, street lighting and other general commercial duties in the Sub-Area.

Salary in accordance with Class "G," Grade 10 (£608/£619/£630) of N.J.B. schedule.

Applications stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary, to arrive by July 18, 1953.

D. G. DODDS,
Secretary.

St. Mellons, Cardiff. (E 336)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

CIVIL ENGINEERING DRAUGHTSMEN
Construction Department
Vacancy No. 22/53

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with office and administrative buildings.

The salary will be in accordance with Grade 5 (£567 to £871 per annum) or Grade 6 (£433 to £567 per annum) of Schedule "D" of the National Joint Board Agreement.

ENGINEERING DRAUGHTSMEN (MECHANICAL)
Construction Department
Vacancy No. 44/53

Senior draughtsmen are required in the mechanical section of the construction department at North Wilford Power Station. Candidates should have experience in one or more of the following:—

(i) Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Grade 5 (£567 to £871 per annum) and Grade 6 (£433 to £567 per annum) of Schedule "D" according to experience.

ENGINEERING DRAUGHTSMEN (ELECTRICAL)
Construction Department
Vacancy No. 61/53

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. switchgear, transformers, E.H.T and L.T. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with Grade 5 (£567 to £871 per annum) or Grade 6 (£433 to £567 per annum) of Schedule "D" of the National Joint Board Agreement.

ASSISTANT SHIFT CHARGE ENGINEER
Northampton Power Station
Vacancy No. 70/53

Applicants should have had sound technical training, be experienced in the operation of modern steam power stations, and should preferably hold the Higher National Certificate in Electrical and Mechanical Engineering.

The salary for this appointment will be in accordance with Class "G," Grade 9 (£641-£867 per annum) of the National Joint Board Agreement.

Closing date for this appointment is July 13, 1953.

The above posts are pensionable within the provisions of the British Electricity Authority and Area Boards superannuation scheme.

Application forms may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham and should be returned to the undersigned by the date stated.

L. F. JEFFREY,
Divisional Controller.
(E 329)

GOLD COAST LOCAL CIVIL SERVICE

ELECTRICAL ENGINEER
Gold Coast Railway.

A VACANCY exists for an Electrical Engineer, Railway Department, in the Local Civil Service of the Gold Coast. Duties are to take charge of the Electrical Workshops at Location and Takoradi Harbour.

Appointment is on contract for two tours in the salary scale: £1,130 to £2,020 per annum, point of entry depending on professional experience. A gratuity of £37 10s. is payable for each completed three months satisfactory service.

Free first-class passages are provided for the officer, his wife and up to three children under the age of 13. Government quarters, if available, are provided at a rental of £60 to £90 per annum. Leave is granted at the rate of seven days for each completed month of resident service after a tour of 18-24 months.

Candidates, preferably between the ages of 40 and 45, must be Corporate Members of the Institution of Electrical Engineers, or hold an equivalent qualification, and have served apprenticeship with a recognised firm of mechanical and electrical engineers. They must have a thorough knowledge of dock cargo handling apparatus and a knowledge and experience of maintenance in workshops where high tension current is used. Knowledge of train lighting system an advantage.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference No.(CDE 110/13/07). (E 299)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

BOILER HOUSE SHIFT CHARGE ENGINEER is required at Nechells "B" Generating Station, Birmingham. N.J.B. service conditions, superannuable appointment. Salary within Schedule "A," Grade J9, commencing at £719 p.a.

Higher National Certificate in mechanical and/or electrical engineering required, together with sound technical training and practical experience in the operation of a large generating station.

Apply on forms available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, or on Form AE6, by July 25, 1953. (E 318)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

Littlebrook Power Station, Class "M"

(a) ASSISTANT SHIFT CHARGE ENGINEER
Grade 9, £906 3s.

APPLICANTS should possess technical qualifications equivalent to graduate membership of either the Institution of Mechanical or Electrical Engineers. Experience in the efficient operation of modern high pressure power station plant with P.F. firing and experience in the administration and control of labour essential. Assistance with housing may be possible for those living at present in rented property.

(b) STATION SHIFT CONTROL ENGINEER
Grade 10, £848 8s.

Applicants who should preferably possess Higher National Certificate in electrical engineering, must have had experience in the operation and control of turbo-generators and in control room duties connected with inter-connected generating systems and E.H.T. feeder network.

(c) JUNIOR ENGINEER (CONTROL)
Grades 21/17, commencing at £427 per annum

Applicants should preferably have had experience in the operation of E.H.T. switchgear and the parallel running of alternators.

(d) JUNIOR ENGINEER (EFFICIENCY)
Grades 21/17, commencing at £427 per annum

The successful applicant will be required to assist the assistant engineers (efficiency) and preference will be given to those possessing Ordinary National Certificate and who have had experience of power station plant.

(e) JUNIOR ENGINEER (CHEMIST)
Grades 21/17, commencing at £427 per annum

Applicants should have matriculated and be studying for Inter B.Sc., or Higher National Certificate.

Croydon "B" Power Station, Class "J"

(f) STATION SHIFT CONTROL ENGINEER
Grade 10, £714

For details see (b).

Operation Department, Divisional H.Q. Kingston

(g) JUNIOR ENGINEER
Class "AX," Grade 9, £415 to £551 5s.

The successful applicant will work in the generation, economics and methods section of the department and applicants should preferably have a knowledge of power station plant. Higher National Certificate or equivalent would be an advantage.

Kingston "B" Power Station, Class "G"

(h) MAINTENANCE ENGINEER (MECHANICAL)
Grade 6, £826 7s.

Applicants should preferably possess B.Sc. degree or equivalent or Corporate Members of the Institution of Mechanical Engineers and must have had experience in the control of labour. Extensive experience in the maintenance of high pressure turbine and boiler plant and power station auxiliaries essential.

(i) JUNIOR ENGINEER (Control)
Class "G," Grades 16/14, commencing at £427.
For details see (c).

Brighton "A" Power Station, Class "H"

(j) ASSISTANT ENGINEER (MECHANICAL PLANNING)
Grade 11, £607

The successful applicant will be responsible for the planning of mechanical plant maintenance and associated labour. Practical experience of power station plant, layout, operation and maintenance essential.

N.J.B. conditions of service. Salaries quoted include London allowance (except Brighton).

Applications giving details of education, present position, experience etc., should be received by the undermentioned, according to location of post not later than July 23.

Station Superintendents, Brighton Power Station, Portslade-by-Sea, Sussex; Littlebrook Power Station, nr. Dartford, Kent; Croydon "B" Power Station, Beddington Farm Road, Croydon, Surrey; Kingston "B" Power Station Downhall Road, Kingston-upon-Thames, and the Establishments Officer, British Electricity House, Lower Ham Road, Kingston-upon-Thames, Surrey. (E 330)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London Allowance, and conditions of service in accordance with N.J.B. Agreement, Schedule "A" or "C". Qualifications entitling to graduate membership of the I.E.E. or I.Mech. E. an advantage.

SHIFT CHARGE ENGINEER
Blackwall Point Generating Station.

Wide experience necessary in operation of modern high-pressure turbine and boiler plant, preferably with P.F. firing. Salary: Class "F", Grade 7, £731 17s. p.a.

ASSISTANT MAINTENANCE ENGINEER (ELECTRICAL)
Woolwich Generating Station.

Extensive experience in maintenance of modern e.h.t. and l.t. switchgear, motors, alternators and all electrical and auxiliary plant appertaining to a generating station. Salary: Class "G," Grade 9, £673 1s. p.a.

STATION SHIFT CONTROL ENGINEER
St. Pancras Generating Station.

Sound technical training, experience of d.c. and operation of h.t. switchgear. Salary: Class "E," Grade 10, £582 15s. p.a.

ASSISTANT ENGINEER (TESTING)
Hackney Generating Station.

Experience of carrying out station plant tests with ability to compile and present statistical data relating to operating station efficiency. Salary: Class "F", Grade 12, £532 7s. p.a.

JUNIOR ENGINEER
Blackwall Point Generating Station.

Duties include operation and control, under supervision, of generating plant. Good opportunities offered for gaining experience with modern P.F. boilers, turbines and auxiliary plant. Shift duties. Previous generating station experience an advantage. Salary: Class "F," Grade 14, £491 p.a.

GENERAL ASSISTANT ENGINEER
(Efficiency and Testing)
Group IV (Barking)

Experience of the testing and/or operation of the mechanical plant in a generating station. Salary: Class "AX," Grade 8, £526 1s. to £670 19s., ultimately rising to £749 14s. (EX.8).

SHIFT CHARGE ENGINEER
Barnes Generating Station

Electrical and mechanical training with practical experience of operation and maintenance of turbines, boilers and rotary convertors. Salary: Class "C," Grade 7, £628/19/- p.a.

Application may be made on form obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Great Portland Street, W.1, and be received within 14 days of this advertisement. (E 316)

EASTERN ELECTRICITY BOARD

Northmet Sub-Area

THIRD ASSISTANT ENGINEER—CONSTRUCTION SECTION (Reference No. 394)

APPLICATIONS are invited for the above-mentioned appointment in the Sub-Area Construction Section, 15 Friern Barnet Road, London, N.11.

The duties of the post include the organisation and control of the laying, jointing, fault locating, repair and maintenance of underground cables up to 33 kV in a densely populated area by direct and contract labour. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

The salary for the appointment will be in accordance with Class "N," Grade 10 of the National Joint Board Salary Agreement, commencing at £946 per annum, plus London Weighting. Both future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, within fourteen days of the appearance of this advertisement. (E 334)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 151/53: SHIFT CHARGE ENGINEER, Greenhill Generating Station, Oldham. Salary range, £649 to £681 (N.J.B. E.7).

Vacancy No. 153/53: STATION SHIFT CONTROL ENGINEER, Barrow Generating Station. Salary range, £531 to £547 (N.J.B. D.10).

Apply, quoting vacancy No. to Establishments Officer, British Electricity House, 825 Wilmslow Road, East Didsbury, Manchester 20, before July 18. (E 333)

THE BRITISH IRON & STEEL RESEARCH ASSOCIATION

ELECTRICAL ENGINEER required by the Plant Engineering Division of the above association for applied research in the iron and steel industry. Candidates should have a degree or similar qualification in electrical engineering and an interest in heavy electrical engineering and closed loop control of electrical machines. Starting salary up to £800 per annum, according to age, qualifications and experience. Location of work, London. Post is superannuated under the F.S.S.U. Written applications only to the Personnel Officer, B.I.S.R.A., 11 Park Lane, London W.1. (E 347)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

No. 4 (Leeds) Sub-Area

Wetherby District.

THIRD ASSISTANT DISTRICT ENGINEER

Applicants should be graduates of the Institution of Electrical Engineers or hold equivalent qualifications.

Experience in the construction, operation and maintenance of h.v. and l.v. underground and overhead distribution systems in a mixed urban and rural district is desirable.

Candidates should be prepared to reside in the district. Salary: N.J.B. Class "E", Grade 9, £587 to £600 p.a.

Applications, giving full details of age, qualifications and experience, should be forwarded to the Manager No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than July 23, 1953.

No. 2 (Huddersfield) Sub-Area

Halifax District.

ASSISTANT CONSUMERS ENGINEER

Applicants should possess the Higher National Certificate in Electrical Engineering, and must have had experience of the work of a consumers' department including the supervision of the test, inspection and connection of consumers' installations, and be capable of advising all types of consumers in the use of electricity. They should be conversant with the I.E.E. and supply regulations, simple hire and hire purchase schemes, and also with the Board's tariffs.

Salary: N.J.B. Class "G", Grade 12, £534 to £555 p.a.

Applications, giving details of age, qualifications and experience, should be forwarded to the Manager No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than July 23, 1953. (E 317)

SOUTHERN ELECTRICITY BOARD

SUB-AREA CIVIL ENGINEERS

NO. 2 (NEWBURY) and No. 3 (Portsmouth) Sub-Areas. Salary N.J.B. Grade 7, Column 1 of the agreement, i.e., £926 for the post at Newbury (Class "L"), and £817 for that at Portsmouth (Class "J"). N.J.B. conditions of service.

The Sub-Area Civil Engineer will be responsible, under the general supervision of the Area Civil Engineer and with architectural advice, for the design, construction and maintenance of all building and civil engineering works throughout the Sub-Area including substation buildings, workshops, stores and office and showroom premises. He will be responsible for carrying the work through to completion and will be required to deal with planning authorities, local surveyors and contractors, and to handle a small direct labour force.

The qualifications required are a comprehensive knowledge of and experience in the design and construction of building and civil engineering works, including the design of steel and reinforced concrete structures and preparation of specification and bills of quantities. The knowledge and experience should be to the standard of associate membership of the Institution of Civil or Structural Engineers or of the R.I.B.A.

Applications on forms obtainable from the Sub-Area Secretary (a) 7 Oxford Road, Newbury or (b) Lower Drayton Lane, Cosham, Portsmouth, and returned in envelopes suitably endorsed, not later than July 20, 1953.

ASSISTANT BRANCH COMMERCIAL SUPERINTENDENT

High Wycombe Branch, Reading District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class "G," Grade 9, Column 1 (£641 per annum). N.J.B. conditions of service.

Candidates must be capable of dealing with the normal tariff and supply queries, preparing estimates when required and supervising the contracting work in the branch. Will be required to assist the Branch Commercial Superintendent in any of his duties.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Road, Newbury, and returned to him in envelopes suitably endorsed, not later than July 20, 1953.

The successful candidates for the above appointments will be required to contribute to the B.E.A. and Area Boards' superannuation scheme, if eligible. (E 327)

HER MAJESTY'S COLONIAL SERVICE

APPLICATIONS are invited for the following post:

MAINS ENGINEER

Electricity Department, Aden.

Appointment is pensionable on probation in the salary scale £650 to £1,250 per annum or on agreement in the salary scale £910 to £1,250 per annum, point of entry depending on approved experience. In addition a temporary variable allowance of up to £240 per annum is also payable.

Free first-class passages are provided for officer, wife and up to four children under the age of 18 once each way each tour. Unfurnished quarters are available at rental of 10 per cent. of basic salary. Furniture can be obtained from Government sources at reasonable rates. Leave is granted at the rate of seven days for each month of residential service in a tour of 18-24 months.

Candidates must be Corporate Members of the Institution of Electrical Engineers or hold an equivalent qualification, and have had extensive experience in the layout, operation and maintenance of distribution and transmission systems up to and including 11 kV, organising and administrative experience required.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference No. (CDE. 145/2/01). (E 300)

HER MAJESTY'S COLONIAL SERVICE

APPLICATIONS are invited for the following post:

ASSISTANT SUPERINTENDENT OF WORKSHOPS

Posts and Telegraphs Department, Nigeria.

Appointment is pensionable, on probation, in the salary scale £830 to £1,560 per annum the point of entry depending on war service and approved experience.

Free first-class passages are provided for the officer and wife and assistance of up to £75 each for a maximum of two children is granted in respect of their passages or maintenance in the United Kingdom. Furnished quarters, if available, are provided at low rents. Leave is granted at the rate of seven days for each month of resident service in a tour of 18 to 24 months.

Candidates between the ages of 25 and 35, must have passed or be exempt from sections A and B of the examination for Associate Membership of the Institution of Electrical Engineers. Candidates must have had some years experience with a commercial firm manufacturing electronic equipment and should be familiar with modern h.f. and v.h.f. radio practice including the servicing of receivers and transmitters.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference No. (CDE. 108/14/06). (E 301)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following post in the Transmission Department at Divisional Headquarters:—

THIRD ASSISTANT ENGINEER

Civil Engineering.

Salary, Class "AX/CX," Grade 5, £649 to £835 per annum, plus London Weighting.

Applicants should have received training in civil and mechanical engineering and qualified for Associate Membership of the Institution of Civil Engineers or Mechanical Engineers.

Applicants should also have had experience in (a) the design and setting out of site works; (b) foundations for buildings and heavy plant; (c) the construction of electrical transmission lines on lattice steel towers.

Applications, stating age, qualifications and experience, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, not later than July 25, 1953.

W. N. C. CLINCH,
Controller.
(E 315)

SENIOR GENERAL ELECTRICAL ENGINEERING INSTRUCTOR

REQUIRED by the MOMBASA INSTITUTE OF MUSLIM EDUCATION, KENYA, for one tour of three years in the first instance, with prospect of re-engagement. Commencing salary, etc., according to qualifications and experience in scale £929 rising to £1,325 a year. Free furnished quarters or allowance in lieu. Outfit allowance £30. Free passages. Superannuation scheme. Candidates must have served an apprenticeship or pupilage to electrical engineering, and have had considerable practical experience. They should be A.M.I.E.E. or G.I.E.E., or possess qualifications exempting from G.I.E.E. examination.

Write to the Crown Agents, 4 Millbank, London, S.W.1, State age, name in block letters, full qualifications and experience and quote M2C/29814/EE. (E 348)

HER MAJESTY'S COLONIAL SERVICE

APPLICATIONS are invited for the following post.

ELECTRICAL ENGINEER

Nyasaland.

Duties include maintenance and operation of steam power and diesel plant. Salary scale £655 to £1,320 per annum, with additional cost-of-living allowance, the point of entry being determined by experience and war service. Commencing salary up to £1,140 for well experienced candidate. Appointment will be on three years' probation for pensionable employment. Free passages, once each way each tour, will be granted to the officer, his wife and children up to the cost of one adult passage. Quarters, if available, are provided at low rent, and leave is granted at the rate of five days for each month of service after a tour of two-three years.

Candidates (maximum age limit 40) should have passed or be exempt from Sections A and B of the Associate Membership Examination of either the Institution of Electrical Engineers or the Institution of Mechanical Engineers, with experience of steam power stations and with knowledge of normal chemical analysis.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference No. (CDE. 145/4/01). (E 302)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of ASSISTANTS (Wayleaves).

The duties will include negotiation with landowners and tenants for wayleaves for transmission lines, settlement of damage claims, arranging for access for construction, etc., and will be concerned mainly with the North Wales area. Candidates preferably should have had experience in rural development with an electricity supply undertaking or similar experience, and ability to speak Welsh would be an advantage.

The salary will be within the range of Grade 2 (at present £460 to £520 per annum) of the National Joint Council Agreement, and the appointment will be subject to a probationary period not exceeding six months.

The appointments are superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, No. 4/5 Sub-Area, Electricity House, Rhostyllen, near Wrexham or at any District Office.

Closing date, July 21, 1953. (E 345)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 139/53. ASSISTANT SECTION ENGINEER in Transmission Department (Padiham Section) based at Padiham, near Burnley. Salary range £564/£800 (AX/EX.6). Sound experience in extra high voltage transformers, tap change gears, circuit breakers and transmission line maintenance is essential. H.N.C. (Electrical) desirable.

Vacancy No. 140/53. STATION SHIFT CONTROL ENGINEER, Agecroft (L.P.) Generating Station, Pendlebury, near Manchester. Salary range £577/£598 (F.10).

Vacancy No. 149/53. SHIFT CHARGE ENGINEER, Chadderton (L.P.) Generating Station, near Oldham. Salary range £649/£681 (E.7).

Apply, quoting vacancy number to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before July 17. (E 298)

CITY OF MANCHESTER

APPLICATIONS are invited for the appointment, on the permanent staff of the City Architect's department, of an ELECTRICAL ENGINEERING ASSISTANT. Salary A.P.T. Grade III £525 to £570 per annum. Candidates must be capable of preparing schemes for electric lighting and power installations in all types of municipal buildings and have passed the intermediate examination of the Institution of Electrical Engineers or possess the Higher National Certificate in Electrical Engineering. Forms of application may be obtained from the City Architect, Town Hall, Manchester 2, and should be returned to the same address not later than July 24, 1953. Canvassing is prohibited. (E 303)

SOUTH WALES ELECTRICITY BOARD

REQUIRED an ELECTRICAL FITTER in District 345 (Pontypridd) in Central Sub-Area of the Board.

Wages and conditions in accordance with the N.J.I.C. agreement, 3s 6½d. per hour, 44 hour week.

Applications giving details of present employment and previous experience should be addressed to the undersigned to arrive by July 18, 1953.

G. HARING,
District Engineer.

District 345,
Glyntaff, Pontypridd. (E 338)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEERS required in the No. 4/5 Sub-Area, based on Sub-Area Headquarters, Electricity House, Rhostyllen, nr. Wrexham. Salary £552 to £573 per annum (N.J.B.J. 13).

The main duties concern survey work for rural development. Experience in the lay-out and construction of H.V. and M.V. overhead lines necessary, particularly in the survey and profiling of routes. Possession of the Higher National Certificate in electrical engineering and ability to speak Welsh advantageous.

The appointments are superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, above address, or at any District Office.

Closing date, July 21, 1953. (E 344)

SOUTH WALES ELECTRICITY BOARD

REQUIRED GENERAL ASSISTANT ENGINEER in Sub-Area engineer's department of the Central Sub-Area at Cardiff.

Applicants should have sound experience of the layout and construction of mains and substations in rural and urban areas.

Salary in accordance with Class "L," Grade 13 (£616/£631/£646) of N.J.B. schedule.

Applications stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary, to arrive by July 18, 1953.

D. G. DODDS,
Secretary.

St. Mellons, Cardiff. (E 337)

APPLICATIONS are invited for the position of WATER HEATING ENGINEER responsible for the design and technical supervision of electric water heaters and allied products. Wide experience in this field is essential but applications from senior draughtsmen and section leaders, to whom this appointment would offer scope for substantial advancement, would be welcome. Our own staff have been informed of this vacancy.—Please write, with full details, to Box No. 2765, Electrical Times. (E 266)

APPLICATIONS are invited from ENGINEERS preferably aged 23 to 28 years, who have served a recognised apprenticeship with an electrical or mechanical engineering manufacturer and hold a Higher National Certificate or equivalent for progressive appointment in the Standard and Specifications Department, the English Electric Co., Ltd., Stafford. The department is concerned with the specifying and standardising of techniques, processes and materials used in a large range of the company's manufactures. Permanent position and pension scheme.—Write, giving full particulars and quoting Ref. 947C to Dept. C.P.S., 336-7, Strand W.C.2. (E 311)

ASSISTANT MECHANICAL MAINTENANCE ENGINEER required for organisation in East London district operating large electrical station. Applicants should have wide and up-to-date experience in the maintenance of modern generating station power plant and be capable of supervising turbine and boiler overhauls. Technical qualifications should be sound. Age not less than 32 or over 45. Commencing salary £950 per annum, with non-contributory pension. Position has excellent prospects.—Reply to Box No. 2727, Electrical Times, quoting Ref. TME/6. (E 194)

ASSISTANT ELECTRICAL ENGINEER wanted for hydro-electric public utility on Nigerian plateau. If possible graduate or A.M.I.E.E. Three years' agreement in two 18-month tours. Generous allowances, free quarters. Superannuation fund maturing at age 55. Minimum salary £65 per month plus 15% cost of living bonus.—Apply, stating qualifications and experience to Box No. 2755, Electrical Times. (E 255)

BRITISH INSULATED CALLENDER'S CABLES LTD., invite applications for the under-mentioned vacancies at their Leigh works:—

ELECTRICAL ENGINEER OR PHYSICIST for work on the design and utilisation of rubber and plastic cables. Qualifications: A degree or equivalent. Age, not over 35. Preferably with previous experience in this field but this is not essential.

ENGINEER/PHYSICIST OR ELECTRICAL ENGINEER to specialise in cables for domestic and industrial wiring. Candidates should have a sound knowledge of installation practice and should be able to undertake development work in this field. The post offers considerable scope to the specialist possessing initiative and enterprise.

Applications should be submitted in writing to The Staff Officer, B.I.C.C. Ltd., Prescot, Lancs. (E 297)

ELECTRICAL contractor (London) has vacancy for ESTIMATOR used to large contracts, capable of handling them from inquiry to completion. Exceptional opportunity for experienced man able to accept responsibility.—Applications will be treated confidentially. State age, salary, with concise particulars of experience, Box No. 2789, Electrical Times. (E 351)

DRAUGHTSMEN required for low-tension small switch and fuse gear and electrical distribution equipment.—Write, giving age, details of experience and salary expected to the Personnel Officer, W. T. Henley's Telegraph Works Co. Ltd., Gravesend, Kent. (E 273)

ELECTRICAL ASSISTANT required for editorial department in London. Preference given to qualified engineer. Previous editorial experience unnecessary, but lively mentality essential. Superannuable.—Write, giving full particulars and salary required, Box No. 2791, Electrical Times. (E 352)

ELECTRICAL ENGINEER. An unusual opportunity is offered to well-qualified electrical engineers familiar with modern heavy-current rectifiers. Further details will be given to those applicants who, from their training, qualifications and experience, appear to be suitable.—Send details to Box No. 2771, Electrical Times. (E 296)

ELECTRICAL ENGINEER experienced in power station installation and commissioning, prepared to work on own initiative. A.M.I.E.E. or equivalent qualification. Pension scheme.—Write, Box No. 658, c/o Walter Judd, Ltd., 47 Gresham Street, London, E.C.2. (E 307)

ELECTRICAL ENGINEER to be responsible for electrical equipment and distribution in a large factory organisation in a north-western county. Applicant should have had several years practical experience in the maintenance of modern electric welding plant including electronic control, diesel engine generation, h.t. and l.t. factory distribution, control of staff, etc. Age 35-45. Salary: commence £800 p.a.—Box No. 2779, Electrical Times. (E 319)

ELECTRICAL ENGINEER, young, required by large firm of electrical contractors opening new offices in London. Experience with known firm of electrical contractors essential, and preference given to young man with knowledge of estimating and supervision of contracts. Connection with consulting engineers and architects an advantage. Excellent opportunity for rapid promotion for applicant with technical qualifications and accustomed to handling staff and customers.—Apply, stating age, experience and qualifications to Box No. 2773, Electrical Times. (E 308)

ELECTRICAL ENGINEERING DRAUGHTSMAN required by Tees-side firm of engineers for the power and lighting installations of their various contracts. The work will include the preparation of control schemes, and wiring diagrams and contract requisitioning of equipment.—Apply, stating age, experience and qualifications to Box No. 2777, Electrical Times. (E 314)

ELECTRICAL LABORATORY ASSISTANT wanted for very high voltage paper-insulated cables. Permanent position but immediate duties would be on an important new development. Degree or H.N.C. standard and previous experience in paper cable work desirable.—Apply, giving full details of experience, etc., to Box No. 2785, Electrical Times. (E 326)

ELECTRICAL WIREMEN required, preferably with experience of electrical control switchgear. First class working conditions, good bonus, canteen and recreational facilities.—Applications to Labour Manager, Marshall, Sons and Co., Ltd., Britannia Works, Gainsborough. (E 305)

ELECTRICIANS required in the Scunthorpe District of the Yorkshire Electricity Board for general installation work. N.J.I.C. rate of pay and conditions of service, the present rate being 3s. 6½d. per hour for a 44-hour, 5-day week.—Applications, giving full details of age, training and experience, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby. (E 320)

FERRANTI LTD. wish to make new appointments in their power transformer design office, and invite applications from suitable candidates for:—

(a) SENIOR DESIGN ENGINEERS.
(b) JUNIOR DESIGN ENGINEERS.

Candidates for the senior appointment should have had previous electrical design experience in power engineering preferably, but not necessarily, on transformers. A university degree is desirable, but other alternative qualifications will be considered. For the junior appointments applications are invited from young graduates or holders of the Higher National Certificate with an interest, and preferably some experience, in design of transformers or other electrical plant.

The appointments are to the permanent staff of an expanding design group and carry attractive salaries with excellent prospects of advancement. The positions are covered by the firm's staff pension scheme.

Forms of application from Mr. R. J. Hebbert, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote Ref. WLE. (E 275)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

FOREMAN OVERHEAD LINESMAN required for service with the Sudan Light and Power Co., Ltd., in Khartoum (Anglo-Egyptian Sudan).

Salary range £E.804 to £E.1,284 (£E.1—£1 0s. 6d.). Applicants should be between the ages of 28 and 45, of strong physique with good experience of overhead lines up to 11kV and must be prepared to work under arduous conditions. Duties will include the construction and maintenance of overhead lines up to 11 kV and the training of Sudanese personnel.

Appointment will be on contract for five years including a period of 12 months' probation, with a bonus payable on completion of the contractual period. A cost of living allowance will be payable in addition to salary. A kit allowance of £E.50 will be payable on appointment. Free living accommodation with basic furniture or an allowance in lieu thereof and free transport will be provided. After satisfactory completion of the probationary period liberal leave on full salary with free passages. There is at present no income tax in the Sudan.

Applications stating age, education, qualifications, experience (with particulars of posts held), present appointment and salary with names of two references should be submitted to the Secretary, The Power and Traction Finance Co., Ltd., Queens House, Kingsway, London, W.C.2. (E 304)

GENERAL ASSISTANT ENGINEER required for the transmission department at headquarters, Liverpool. Salary £501 to £639 per annum. N.J.B. conditions. Superannuable and subject to medical examination. Applicants should have had experience in the installation and maintenance of high voltage switchgear overhead lines, cables and transformers and should have qualifications entitling them to graduate, student or similar membership of an appropriate institution.—Application forms may be obtained from the Divisional Secretary, British Electricity Authority, Merseyside and North Wales Division, Beaconsfield Road, Woolton, Liverpool. Closing date July 24, 1953. (E 335)

MESSRS. DOWDING AND MILLS, LTD., of Birmingham, have vacancies at their London works for ARMATURE WINDERS. First-class men only need apply—Dowding and Mills, Ltd., Whitepost Lane, Hackney, E.9. (E 342)

NATIONAL COAL BOARD invite applications for a superannuable appointment as ENGINEERING ASSISTANT (Building) in the electrical sub-section of the engineering branch at London headquarters. The duties of the post include the design of schemes, preparation of specifications, schedules, lighting, power and switchgear layouts for industrial electrical installations. Candidates should have served an apprenticeship and be in possession of the Ordinary National Certificate.

Salary range, £450 to £750 per annum, inclusive.

Write, giving full particulars (in chronological order) of age, education, qualifications and experience (with dates) to National Coal Board, Establishments (Personnel), Hobart House, Grosvenor Place, London S.W.1, marking envelope TT/651. Original testimonials should not be forwarded. Closing date August 1, 1953. (E 346)

PHYSICIST, ELECTRICAL ENGINEER or CHEMIST required by large firm of Cable Makers and Electrical Engineers for responsible technical and development work on rubber and plastic cables of all types. Applicants should preferably have had previous experience with low voltage power and lighting cables. This is a senior post offering considerable scope for a man with outstanding qualities.—Reply to Box No. 2767, Electrical Times. (E 288)

PIRELLI GENERAL CABLE WORKS LTD. invite applications for Steel Tower Transmission Line ENGINEER/SURVEYOR.—Write giving full particulars of experience and salary expected to Overhead Lines Department, Eastleigh, Hants. (E 289)

REPRESENTATIVE of outstanding ability required for London and Home Counties by a leading electrical engineering company. Applications will only be considered from experienced men with a connection in the lamp and electrical industry.—Write with full details of age, experience, qualifications and salary required to Staff Manager, Siemens Electric Lamps and Supplies Limited, 38/39 Upper Thames Street, London E.C.4. (E 290)

REVO ELECTRIC CO., LTD., Tipton, require DRAUGHTSMEN for air-break switchgear development. Five-day week, pension scheme and social welfare. Salary will be commensurate with experience and ability.

Applicants must apply in writing, giving details of qualifications and experience to the Manager of the Drawing Office. (E 345)

SALES ENGINEER with electrical and mechanical experience, required by well-known engineering firm, Newcastle-on-Tyne.—Box No. 2769, Electrical Times. (E 292)

SALES ENGINEERS with experience of rotating plant and allied equipment required by Lancashire Dynamo and Crypto Ltd. in the London area.—Write giving details of age, training and experience to Ref. V.W.P., St. Stephen's House, Victoria Embankment, S.W.1. (E 291)

SALES REPRESENTATIVE for London and Home Counties required by P.V.C. insulating sleeving manufacturers. It is essential that the applicant has drive and initiative.—Particulars of past experience and salary required to Plasticable, Ltd., Hawley Lane, Farnborough, Hants. (E 321)

TECHNICAL WRITER conversant with the preparation and layout of operating and maintenance instructions and spare parts lists required by the English Electric Co., Ltd., for their Switchgear Department, Stafford Works.

Practical and theoretical training in electrical and mechanical engineering, and the ability to write clear, concise technical English are essential qualifications for this position. Permanent appointment and pension scheme.—Apply, quoting Ref. 1070A, to Dept. C. P. S., 336-7, Strand, W.C.2. (E 312)

TRANSFORMER ENGINEER required, fully experienced in the design of transformers up to 132,000 V. This position is with a progressive transformer organisation and offers excellent opportunities for an ambitious engineer with the necessary experience.—Write, giving full particulars to Box No. 2763, Electrical Times. (E 277)

TRANSFORMER manufacturers in South of England require a CHIEF ENGINEER to control all engineering aspects of design up to 30 MVA 132 kV. This is an executive position with a progressive company. A university degree and membership of the Institution of Electrical Engineers is desirable.—Applications with details of experience and salary expected to Box No. 2781, Electrical Times. (E 324)

W. T. GLOVER AND CO., LTD., Electric Cablemakers Trafford Park, Manchester, are extending the Accessories Drawing Office and Design section. DRAUGHTSMEN (2) required, preferably experienced in the design and inspection of cable accessories up to the highest voltages. The positions are progressive and offer good opportunities for advancement.—Apply, giving full details, to the Secretary. (E 322)

APPOINTMENTS WANTED

ENGINEER, Grad.I.E.E., A.M.I.Plant.E. (31), experienced all types installations, h.t. and l.t., plant maintenance, 3½ years consulting engineers on generating station construction, seeks progressive position U.K. or overseas.—Box No. 2723, Electrical Times. (E 187)

PROTECTION and Control ENGINEER, extensive experience in application, engineering and commissioning of protective and control equipment for major generation and transmission installations home and overseas, seeks responsible position. North East coast.—Box No. 2713, Electrical Times. (E 151)

WINDING SHOP FOREMAN, thoroughly experienced winding/assembling/testing all types and sizes of machines a.c.-d.c., repair shop or production, desires change.—Box No. 2735, Electrical Times. (E 201)

WORK WANTED

A. C. and d.c. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co. Ltd., Stanmore, Middx. (E 13)

FISHER FOUNDRIES LTD., Greet, Birmingham, have immediate capacity for machine moulded PRECISION CASTINGS in gunmetal and grey iron, ¼ to 30 lb. All castings shot blasted.—Telephone: Birmingham, Victoria 0197. (E 17)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (E 18)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co. Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (E 8)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co. Ltd., 22-26 Britannia Walk, London N.1. (E 4)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady Street, Bethnal Green, E.1. (E 1)

WANTED, Good Second-hand 6-ton Overhead ELECTRIC CRANE, span 72 ft., lift 18 ft.; electric, 440/3/50. Crane Gantry for above Crane 350 ft. long.—Jarrow Tube Works, Ltd., Northbourne-road, Jarrow-on-Tyne. (E 207)

WANTED, Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (E 2)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (E 6)

AGENCIES

ENGINEER with long-standing connections with architects, consultants, industrial concerns, contractors and wholesalers, requires additional agency, Kent, Surrey, Sussex, Hants.—Box No. 2787, Electrical Times. (E 300)

DISTRIBUTOR/STOCKIST wanted for fast selling industrial reversing switch. Generous discounts.—Write for full terms and information, Box No. 2783, Electrical Times. (E 325)

M.A.A.—THE BADGE OF A GOOD MANUFACTURERS' AGENT. Manufacturers requiring reputable Agents are invited to communicate with the Secretary, The Manufacturers' Agents Association of Great Britain and Ireland (Inc.), Rosebery House, 8 Brearus Buildings, London E.C.4. Membership available to established agents only. Particulars supplied. (E 40)

BUSINESS OPPORTUNITIES

H.P. FUNDS available. Apply with requirements and full particulars of trade.—Box No. 2775, Electrical Times (E 309)

FOR SALE

CABLES & WIRE

ELECTRIC CABLE, twin cab tyre, 14/012, price 40/- per 100 yd. drum.—H. H. Bradford Ltd., Ramsey, Harwich, Essex. (E 240)

TINNED STEEL ARMATURE BINDING WIRE. All sizes from 14 s.w.g. to 30 s.w.g. supplied in coil or on reels.—Frederick Smith & Co., Wire Manufacturers, Ltd., Caledonia Works, Halifax. (E 41)

1,000 yards 1680/·0076 in. 400 amp WELDING CABLE, T.R.S. Brand new stock.—Saxonia, Greenwich, S.E.10. (E 257)

DOMESTIC APPLIANCES

GRUBB IMMERSION HEATERS. No purchase tax on the 7 kW models. Provision for usual domestic loadings as required. All sizes, 16 in. to 30 in. Immediate delivery.—For particulars and trade terms, write distributors, John Owner and Co. Ltd., Springfield Road, Birmingham 13. Tel.: Springfield 2939. (E 22)

ENGINEERING PLANT & MATERIALS

FOR SALE: Spencer (Melksham) Portable SACK PILER, complete with self-contained a.c. motor; will pile to 35 ft.—Robert Morton and Co., Ballymena, N. Ireland. (E 293)

PARKER'S sheet metal FOLDING MACHINE, heavy vice model, capacity 18 gauge M.S. by 2 ft. wide, loose attachments for radio chassis making, weight 22 lb. price 42s. 6d. Attachments 1s. 6d. per foot, carriage 4s., with attachments 5s. 6d. Send for details.—A. B. Parker, Wheatcroft Works, Wellington Street, Batley, Yorks (Tel. 426). (E 247)

GENERATING PLANT

D.C. GENERATORS. Two 540 kW, 130/175 V D.C. GENERATORS by Bruce Peebles, 4,125/3,075 amps. Shunt interpole, open-type frames, split carcase. Suitable for direct coupling. Speed 428 r.p.m.

350 kW, 250 V D.C. GENERATOR by G.E.C. Six-pole, compound interpole. Suitable direct coupling only. Speed 300 r.p.m.

250 kW GENERATOR by Met-Vick for 500/400 V d.c., two-wire, 500 amps. Speed 375 r.p.m. Open type, compound wound.

200 kW GENERATOR by E.C.C. for 200 V d.c., speed 1,000 r.p.m. Open type, single pedestal bearing. Compound wound, fitted interpoles.

200 kW GENERATOR by Mavour and Coulson for 500 V d.c., 400 amps. Speed 380 r.p.m. Open type, six-pole, compound interpole wound. Single pedestal R.O.B.

75 kW CROMPTON, 110 V d.c., 525 r.p.m., 682 amps. Shunt interpole wound.

George Cohen Sons and Co. Ltd., Wood Lane, London W.12 (Tel.: Shepherds Bush 2070), and Stanningley, nr. Leeds (Tel.: Pudsey 2241). (E 248)

LIGHTING EQUIPMENT

PURLEY CHOKES AND BALLASTS. Our 80 W tapped h.p.f. ballast, with starter switchgear-holder incorporated, is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard, Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (E 14)

METERS

A.C.-D.C. QUARTERLY and SLOT METERS.—Brent Electrical Co., 6 Holmdale Gardens, London N.W.4. (E 5)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (E 10)

SWITCHGEAR

MERCURY SWITCHES are made by Hall, Drysdale and Co. Ltd., of 58 Commerce Road, Wood Green, London N.22. Tel.: BOW 7221. (E 11)

TIME SWITCHES for sale. Reconditioned or new. 12 months' guarantee. Immediate delivery.—Lists from J. W. Hughes, 3 St. Thomas's Street, London Bridge, S.E.1. (Tel.: HOP 2759.) (E 23)

MOTORS & STARTERS

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105, Chiswick 5605, 67 Rothschild Road, W.4. (E 7)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Road, East Dulwich, S.E.22. (Forest Hill 2278-9.) (E 3)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (E 9)

FOR SALE, 160 b.h.p. ELECTRIC MOTOR by Mather and Platt, 1,460 r.p.m., 400-440 V, 50 c/s. Continuous rating, squirrel cage, screen protected. In good condition. —Apply, The Cementation Co., Ltd., Ellerbeck Site, Slaidburn, nr. Clitheroe, Lancs. Tel.: Slaidburn 228. (E 323)

MARTIN'S armature and field winder in one unit is the perfect answer to winding your own small motors.—Arrow Works, 147 Camden Road, Tunbridge Wells. (E 32)

All types and sizes of
Industrial Electrical Equipment

ELECTROPOWER COMPANY LIMITED
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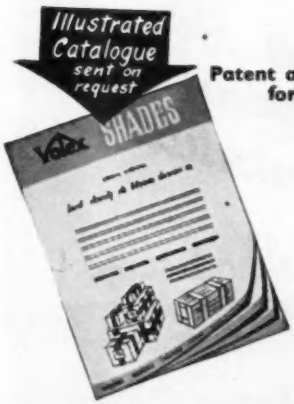

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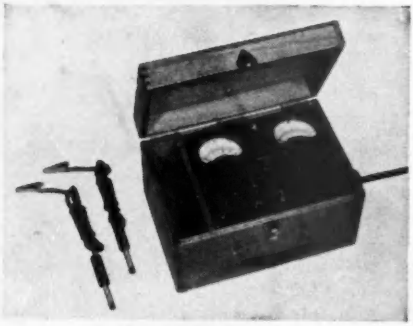

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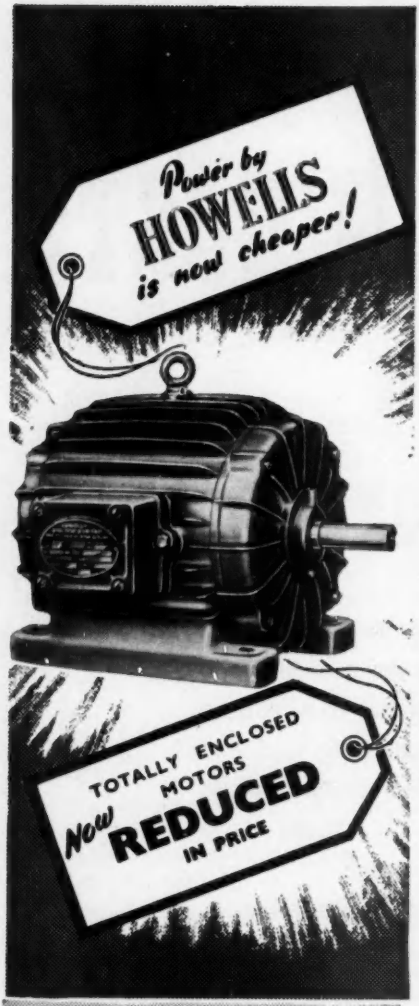

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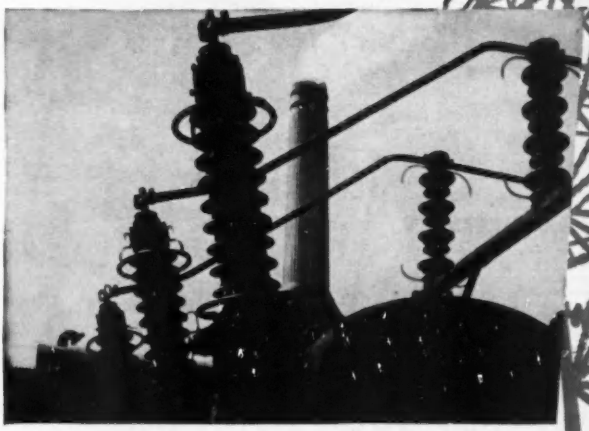

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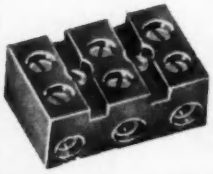

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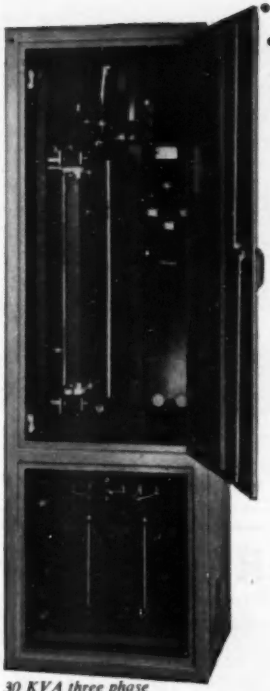

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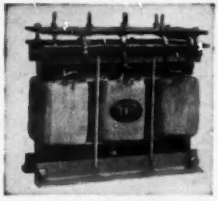

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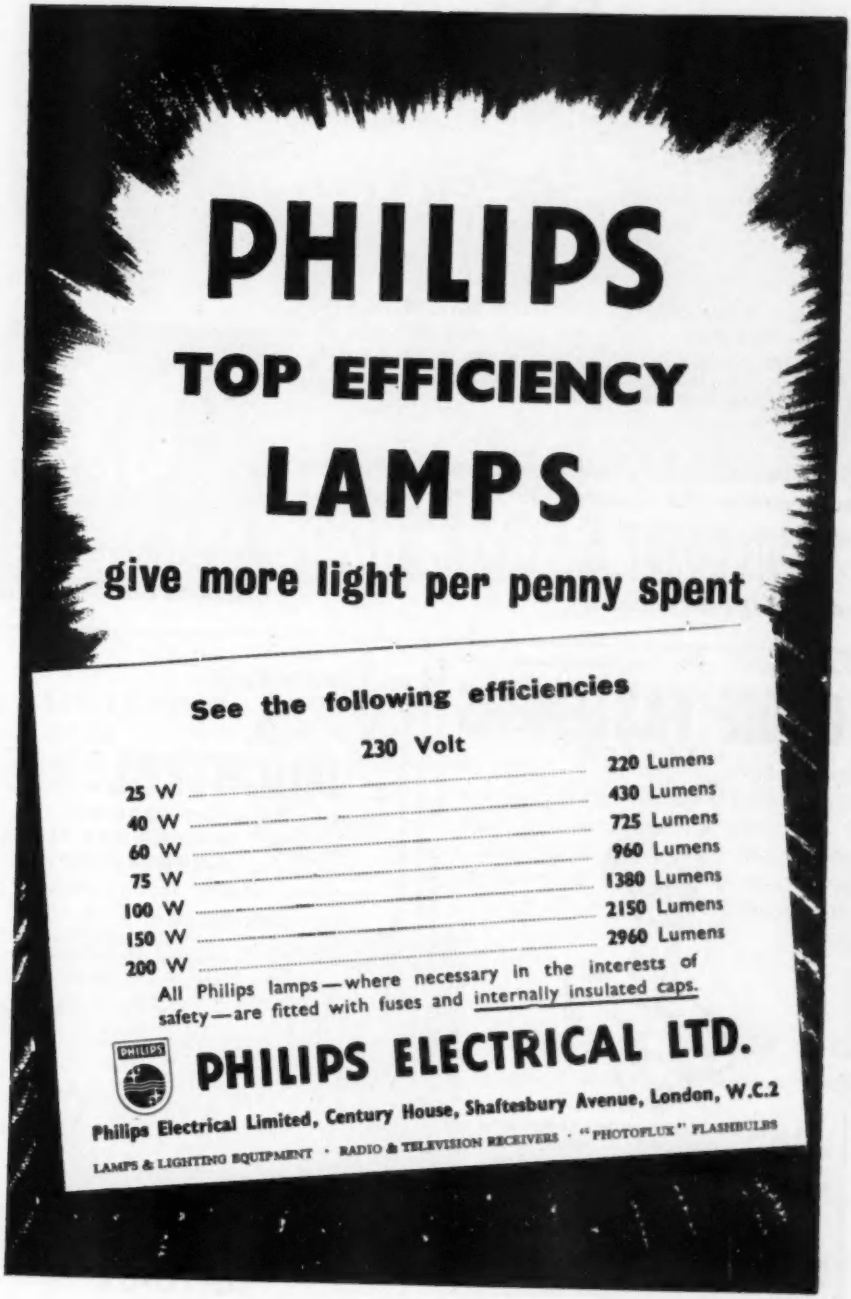
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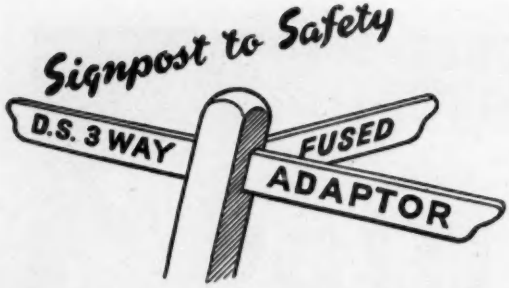

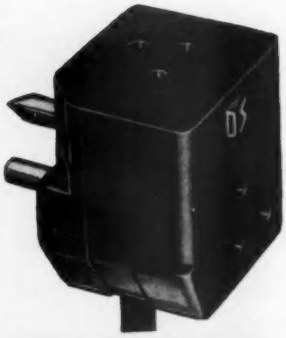

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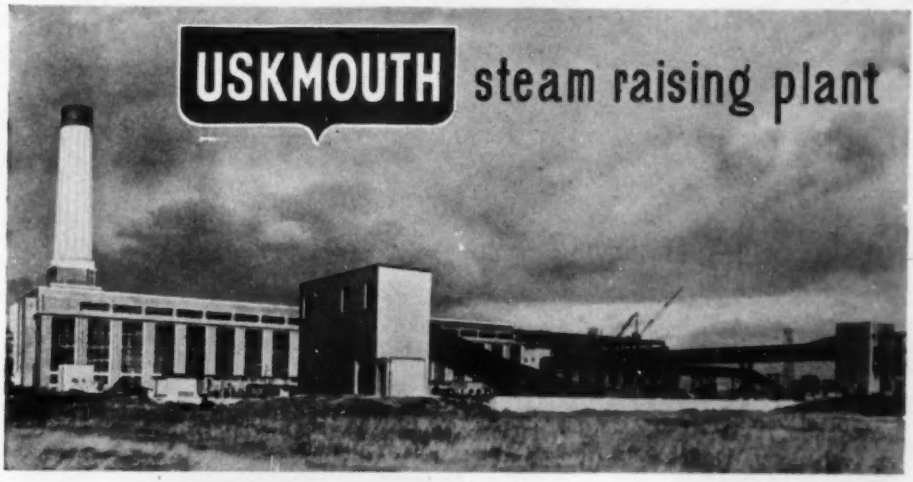

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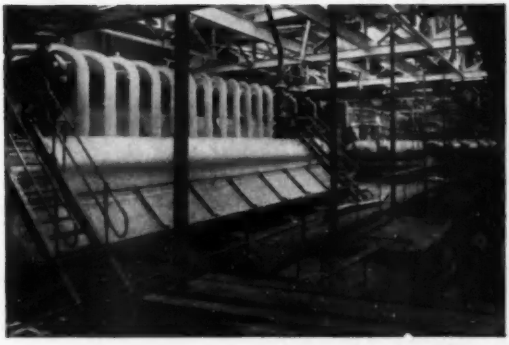

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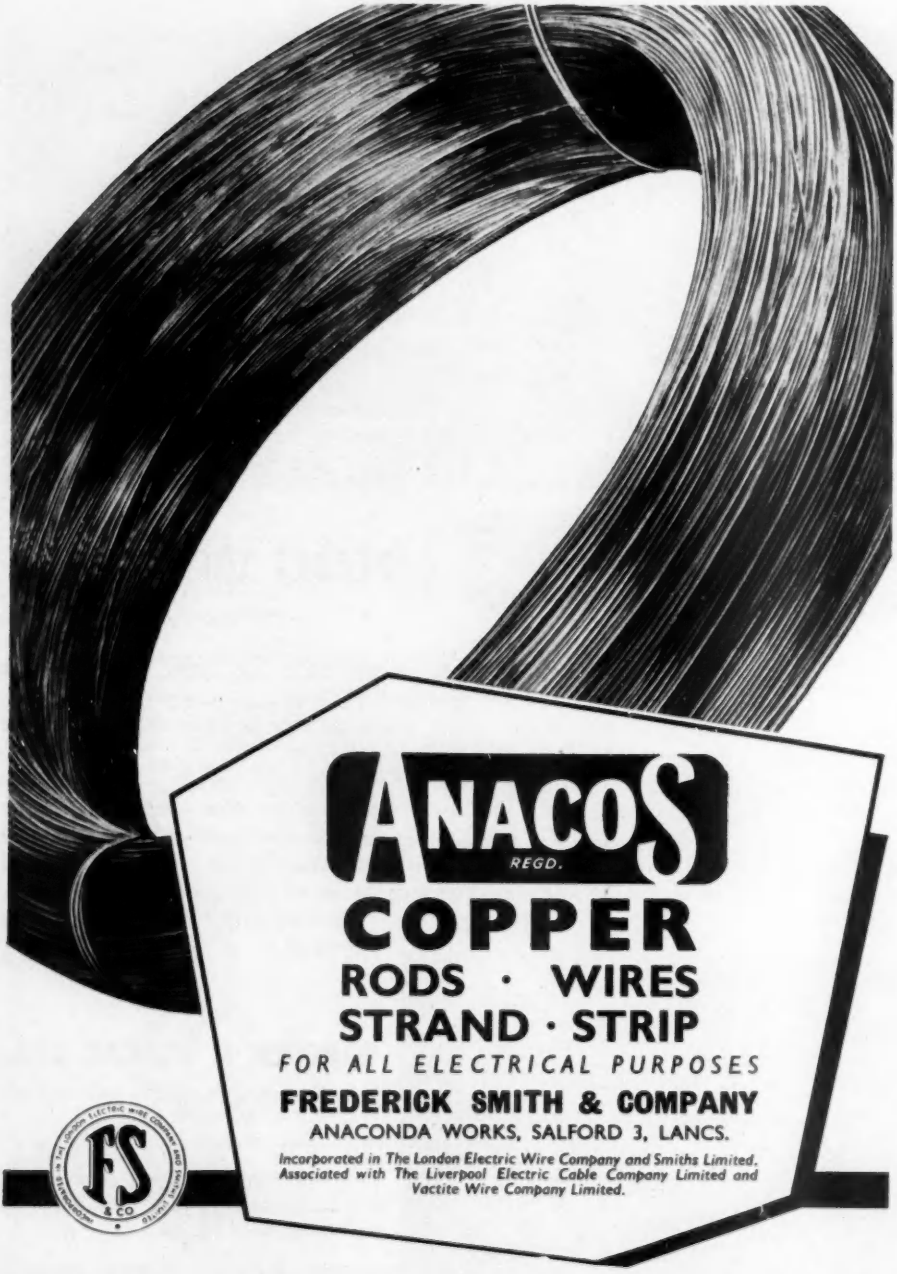

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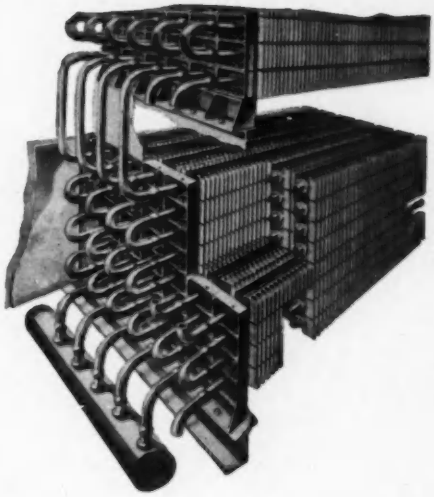


The illustration shows the construction of the tube elements in the Senior Welded Economiser, as used in modern Generating Stations. Maximum heat transfer is effected by H-gilled sleeves which are shrunk on cold-drawn steel tubes, all tube joints being welded. The construction is suitable for all operating pressures.

senior

ECONOMISERS LIMITED

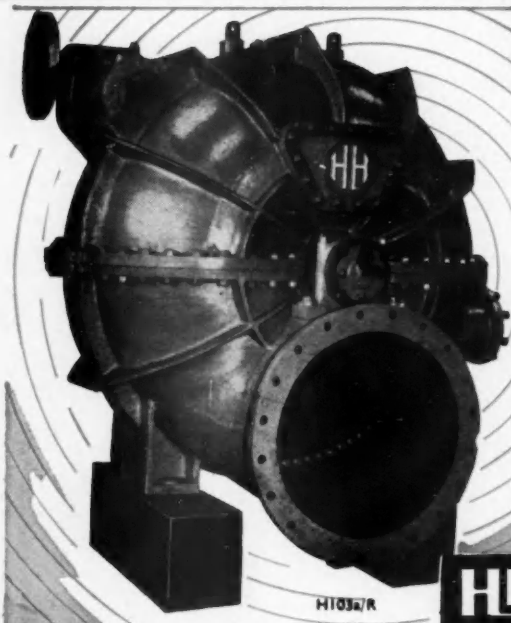
11 SOUTHAMPTON ROW, LONDON, W.C.1 TEL: HOLBORN 7543-4 & 1158 'GRAMS: SENIORECO WESTCENT LONDON

QUALITY
DELIVERY

Denis Ferranti Group

DENIS FERRANTI METERS LTD.

Telegrams: "Deferranti, Bangor" BANGOR AND PENYGROES, NORTH WALES Telephone: Bangor 860
Sole distributors in Canada: Dawson Electrical Supply Co., 422 McGill St., Montreal, Canada



SELF CLEANING ROTARY WATER STRAINERS

CAPACITIES:
200,000 to
3,600,000
Gallons per hour

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